U. S. Government RESEARCH REPORTS

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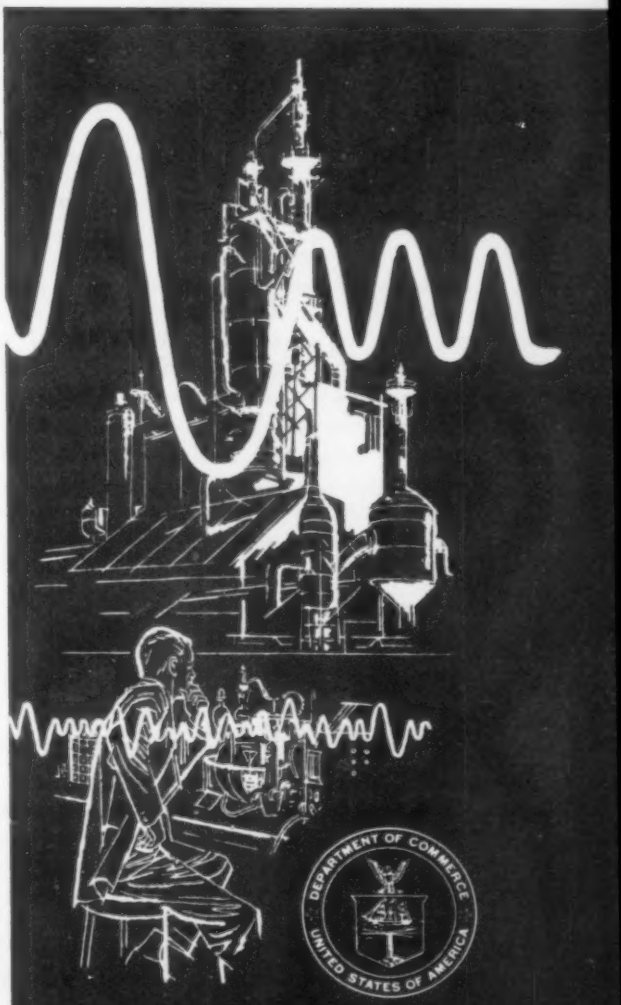

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION
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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, June 30, 1961.

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This publication is issued twice a month to announce new reports of research and development released by the Army, Navy, Air Force, Atomic Energy Commission, and other agencies of the Federal Government. Unless otherwise indicated, reports listed are available from the Office of Technical Services. Some are reproduced by photo-offset printing, others by photocopy reproduction.

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On July 1 the Armed Services Technical Information Agency and the Office of Technical Services entered into a cooperative agreement which increases substantially the number of government reports available to science and industry. A pooling of resources was required to effect this step; this also entailed a decision by our office to use the ASTIA Technical Abstract Bulletin as the mechanism for announcing those reports generated by the military services.

Since this agreement was inaugurated, ASTIA and OTS have been commended for the initiative displayed in working out this plan. However, the current absence of subject indexes and a table of contents has caused some disappointment. I can assure you that both ASTIA and OTS recognize the value of these information aids.

In this issue we are restoring the table of contents. In fact, you will find two tables of contents, one applicable to the TAB section and a second covering older military reports and reports received by OTS from civilian agencies of the Federal establishment. It is too early to make a specific promise concerning the restoration of indexes; however, I can assure you that the two agencies are hard at work on this problem and I am confident that constructive measures will result.

Sincerely yours,

JOHN C. GREEN, Director
Office of Technical Services

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-258 428 Div. 1
(26 June 61) OTS price $8.60

Air Force Flight Center, Edwards Air Force Base, Calif.
T-37B CATEGORY II PERFORMANCE TEST (APPENDIX 3), by Forrest W. Worthington and Emil Sturmthal. Apr 61, 98p. (Appendix 3 to Rept. no. AFFTC TR 61-16, AD-257 715)
Unclassified report

DESCRIPTORS: Training planes, *Jet training planes, Jet planes, Flight testing, Take-off, Airplane landings, Thrust.

Contents:
Test data corrected for instrument error
Take-offs
Sawtooth climbs
Check climbs
Speed power
Landing
Thrust run

AD-258 452 Div. 1, 27
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
KNOWLEDGE IS POWER (SELECTED ARTICLES).
Nov 60, 10p. incl. illus. (Trans. no. MCL-191 from Znaniye - Sila 4:pp. 23-26, 44, 45, Apr 59)
Unclassified report

DESCRIPTORS: *Helicopters, USSR, Technological intelligence, *Rocket propulsion, Military personnel, Solid rocket propellants, *Electric propulsion, *Personnel.

Helicopters are briefly discussed in the three selected articles. In the first article a short history of Soviet helicopters is presented with mention made of the Mi-1, Mi-4, YaK-24, Ka-10, Ka-15, and the Ka-18 helicopters. The second and third articles deal briefly with electric helicopters and with rockets for pedestrians (rocket belts).

AD-258 455 Div. 1, 33
(21 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WINGS OF THE HOMELAND (SELECTED ARTICLES).
1 Mar 61, 20p. incl. illus. table (Trans. no. MCL-306 from Kridla Vlasti 10:pp. 11, 14, 15, 24-26, 1959)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, Helicopters, *Air transportation, Transport planes, *Parachute jumping, Design.

Contents:
From a model to supersonic speeds; development of the Yak-24 helicopter
Chechoslovak IL-14T transport aircraft; modification of the IL-14 passenger aircraft to enable the transport of cargo
Theory of parachute jumping/Parachute jumping for landing accuracy; methods the parachute jumper can use to assure accurate landings

AD-258 456 Div. 1, 33
(21 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CIVIL AVIATION (SELECTED ARTICLES).
16 Dec 60, 7p. incl. illus. (Trans. no. MCL-341 from Grazhdanskaya Aviatsiya 5:pp. 22, 23, 30, 31, May 59)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Civil aviation, *Air transportation, Landing, Air traffic control systems, Autogyros, Deserts.

Contents:
Landing from a straight line flight, an important means to increase efficiency of flights
Mi-4 gyroplane in a desert

AD-258 471 Div. 1, 12, 21
(21 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MODERN AVIATION ENGINEERING (Sovremennaya Aviatsionnaya Tekhnika),
by L. S. Kamenomostskiy. Feb 61, 31p. incl. illus. (Trans. no. MCL-677 from Izdatel'stvo Znaniye, Moscow, 31p. 1959)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Civil aviation, Supersonic planes, Aerodynamics, Transport planes, Jet planes, Helicopters, Guided missiles, Rockets, Hypervelocity vehicles, *Aircraft, Vertical take-off planes, Nuclear power plants.

Contents:
Supersonic aircraft
Transport aircraft
Helicopters
Certain technical characteristics of modern aircraft
Guided missiles
New trends in aviation engineering

Division 1 - AIRCRAFT AND FLIGHT EQUIPMENT

AD-258 472 Div. 1
(21 June 61) OTS price $11.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METHODS AND MEANS OF INSPECTION OF GEOMETRIC PARAMETERS IN AIRCRAFT CONSTRUCTION (Metodi I Sredstva Kontrolya Geometricheskikh Parametrov V Samoletostroyenii),
by N. A. Dokunina. Feb 61, 147p. incl. illus. tables (Trans. no. MCL-679 from Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti, Moscow, 131p., 1959)
Unclassified report

DESCRIPTORS: *Aircraft, Manufacturing methods, Templates, Quality control, Technological intelligence, USSR, *Airframes, *Airplanes, Forging.

A systematic presentation of material on methods and means of inspection of the geometric parameters of parts, units and production aids specific for aircraft construction is presented. Descriptions and data on the accuracy of means and methods of inspecting are given and the basic principles for selection of the means of inspection in aircraft construction are discussed. This material is intended for technologists, foremen, and inspectors in pattern shops, shops for blank preparation and assembly equipment, forge shops, and assembly rooms of aircraft manufacturing plants. (Author)

AD-258 476 Div. 1
(21 June 61) OTS price $10.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HIGH ALTITUDE EQUIPMENT OF AIRCRAFT (SELECTED CHAPTERS) (Vysotnoye Oborudovaniye Samoletov),
by L. T. Bykov, M. S. Yegorov, and P. V. Tarasov. 27 Feb 61, 132p. incl. illus. tables (Trans. no. FTS-9794 of Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennost, Moscow: pp. 175-200, 331-386, 1958)
Unclassified report

DESCRIPTORS: *High altitude, *Aircraft equipment, USSR, Ventilation, *Oxygen equipment, *Pressurized cabins, *Aviation safety.

AD-258 496 Div. 1, 33
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WINGS OF THE NATION (SELECTED ARTICLES).
16 Dec 60, 20p. incl. illus. (Trans. no. MCL-348 of Kryl'ia Rodiny 5:pp. 22-26, 1959)
Unclassified report

DESCRIPTORS: USSR, *Airplanes, Aircraft, *Helicopters, Growth, Design, *Aviation personnel, History, Flight, Civil aviation, *Jet planes.

AD-258 530 Div. 1
(27 June 61) OTS price $1.50

Bolt, Beranek, and Newman, Cambridge, Mass.
AUDIO WARNING SIGNALS FOR AIR FORCE WEAPON SYSTEMS,
by J. C. R. Licklider. Rept. on Flight Display and Flight Control Integration. Mar 61, 1v. incl. illus. tables.
(Contract AF 33(616)5611, Proj. 6190)
(WADD TR 60-814) Unclassified report

DESCRIPTORS: Safety devices, Aircraft equipment, *Display systems, Acoustics, Human engineering, Design, *Flight instruments, Speech, Intelligibility, Air Force, Air force equipment, Monitors, Auditory signals.

This report presents technical information on the design, selection, and use of audio warning signals. It describes a procedure for specifying the acoustical characteristics of warning signals required to meet the exigencies and conditions expected for a given Air Force system, whether it be ground-based, airborne, or spaceborne. The procedure brings together the several applicable design criteria, the constraints imposed by the system, and the conditions under which the system must operate. The procedure then sets those considerations into interaction with characteristics of human sensation, perception, and reaction and from that interaction determines the acoustical specifications of the warning signals. A magnetic tape recording illustrates the procedure and provides an auditory display of the dimensional system in terms of which the warning signals are specified. (Author)

AD-258 534 Div. 1
(27 June 61) OTS price $11.50

Convair, San Diego, Calif.
ANALYSIS OF CONVAIR-990 ADVERSE WEATHER SYSTEMS,
by A. Segal, F. Hekking, and R. O'Neill.
28 Mar 61, 1v. incl. illus. tables (Rept. no. ZJ-30-003)
Unclassified report

DESCRIPTORS: *Transport planes, *Jet planes, Aircraft equipment, Safety devices, *All weather aviation, *Aviation safety, *Ice prevention, Turbojet engines, Turbojet inlets, Tails, Windshields, Design, Jet engine inlets, *De-icing systems, Pitot tubes.

The adverse weather systems for the Convair Model 990 (CV-990) are similar and in many cases identical to the Convair Model 880 (CV-880) systems. The following CV-880/990 systems are identical; compressor nose cone anti-icing, empennage de-icing, windshield anti-icing and anti-fogging, and windshield rain clearing. The systems unique to the CV-990 are anti-icing of the wing slats and inboard leading edge sections, engine inlets, ram air intakes on the horizontal stabilizer, and anti-ice control. A detailed description and performance analysis of the CV-990 wing slat, engine inlet and stabilizer intake anti-icing systems are presented. For systems common to the CV-880/990, the system description is omitted and only the critical design point is analyzed. The purpose of the analysis is to demonstrate the adequacy of each system for safe flight through icing conditions, as defined in the Civil Air Regulations, Amendments 4b-2 and 4b-6. (Author)

AD-258 540 Div. 1, 6, 30
(26 June 61) OTS price $10.50

Douglas Aircraft Co., Inc., El Segundo, Calif.
ARMY-NAVY INSTRUMENTATION PROGRAM AIRBORNE RE-

SEARCH SYSTEMS (FIXED WING - GENERAL ATTACK MISSION).
5 May 61, 142p. incl. illus. tables, 23 refs.
(Rept no. ES 40026)
Unclassified report

DESCRIPTORS: *Control systems, Control panels, Display systems, *Flight simulators, *Data processing systems, Airborne, Instrumentation, *Jet planes, Jet fighters, Jet bombers, Attack bombers, *Cockpits, *Human engineering, Design, *Flight instruments, Detectors.

An advanced system for aircraft flight control and data presentation is described. This system is proposed as the fixed wing attack research system of the Army-Navy instrumentation program. The arrangement consists of an integrated cockpit with the appropriate display and control equipment and as much of the computation, display generation and sensory equipment as required for installation in an aircraft. For ground simulation work additional sensory inputs and computation equipment would be externally contained. Sensors envisaged for this system are current state-of-the-art equipment. The significant improvements are in the data display and data processing. The data processing by a central unit is the major achievement to be demonstrated. Accordingly, mathematical description of the various functions to be implemented is included. The system reflects the maximum integration considered to be consistent with the economic and technical states predicted for implementation in 1964-65. (Author)

AD-258 545 Div. 1, 22
(26 June 61) OTS price $11.00

Frankford Arsenal, Philadelphia, Pa.
A BASIC INVESTIGATION OF CONTROLLABLE THRUST DEVICES FOR ESCAPE FROM SPACE VEHICLES. PHASE 1, PART 1, VOLUME II. SUPPORTING DATA,
by Charles W. Boaz. Feb 61, 127p. incl. illus. tables, 29 refs. (Rept. no. R-1548)
(In cooperation with the Southwest Research Institute, San Antonio, Texas)
(WADD TR 60-349) Unclassified report

DESCRIPTORS: *Spaceships, *Explosive actuators, Control, *Catapults, Design, *Ejection seats.

A basic investigation for controlling thrust from propellant actuated devices used for escape from space vehicles was completed. Various devices used to measure and control temperature, pressure, fluid flow, and liquid level were examined for the start-stop and rate control areas, the principles of operation outlined, and a performance evaluation made in a space environment zone from 75,000 to 300,000 feet. Constant-volume closed chamber, constant-volume vented chamber, and variable-volume closed-chamber systems (gas-operated devices) were analyzed. Charge design studies were made with emphasis on developing analytical means for solving the charge design problem. An analytical method for designing charges was developed for several ballistic systems and dimensionless ratios simplified the final design. A detailed analytical model of the seat-ejection catapult was developed and a specific computation made for the M3 catapult. Stress is laid upon heat-transfer in the discussion of the catapult. The solution procedure suggests the need for programming the procedure for digital computer operation. (Author)

AD-258 547 Div. 1
(26 June 61) OTS price $7.60

Frankford Arsenal, Philadelphia, Pa.
EVALUATION OF TEFLON-LINED HOSE AND PAD SYSTEM COMPONENTS,
by E. J. Doebley. Mar 61, 70p. incl. illus. tables (Rept. no. R-1555)
(WADD TR 60-458) Unclassified report

DESCRIPTORS: *Aviation safety, Test equipment, Instrumentation, *Transmission lines, Jettisonable equipment, Tests, *Hoses, Hose couplings.

An evaluation program was conducted on Teflon-lined hose, check valves, and hose disconnects to be used in emergency escape systems. Various hose lengths and simulated escape systems were used to determine the relation between pressure and hose length, and the possibility of hose or valve failure. The data obtained indicated that the characteristics of a number of Teflon-lined hose assemblies were comparable with respect to pressure vs hose length. Data derived from the evaluation of the check valves indicated that these units would require improved sealing to reduce leakage. (Author)

AD-258 561 Div. 1, 2, 14
(27 June 61) OTS price $6.60

Kaysam Corp. of America, Paterson, N. J.
STUDY OF PHYSICAL AND CHEMICAL CHARACTERISTICS OF BALLOONS AND BALLOON MATERIALS,
by Eric Nelson, ed. by John Kantor. Quarterly progress rept. no. 4, 25 Jan-24 Apr 61.
24 Apr 61, 56p. incl. illus. tables (Rept. no. 4)
(Contract DA 36-039-sc-84925, Proj. 3A99-07-001-08)
Unclassified report

DESCRIPTORS: *Meteorological balloons, Materials, Physical properties, Chemical properties, Flight testing, Plasticizers, *Elastomers, Balloons, Polymers, Infrared radiation, Ultraviolet radiation, Radiation damage, Mechanical properties, High altitude, Films, Design, Aerodynamic configuration, Ozone, Meteorology.

Mobilsol L was evaluated at room temperatures and shown to have similar properties to dibutyl sebacate and butyl oleate. Merac, a water-soluble accelerator produced very flat-curing compounds. A series of compounds were prepared to improve the low-temperature characteristics and ozone resistance of balloons designed to reach altitudes above 120,000 ft. A major improvement was obtained by increasing the wall thickness of the balloon. An increase in the plasticizer content of balloons containing Lytron 615 resulted in an improvement in bursting altitude. Balloons in the 1500- to 2000-g classes were made from dual-purpose compounds. Tests on balloon compounds indicated that the rate of ozone attack is greater at low elongations than at high. UV radiation of 3600-angstroms wavelength had no effect on the physical properties of balloon compounds even after exposure for 2 hr in a stretched condition. Flights with balloons having a streamlined tail attached reached equal altitudes at similar rates of ascent by day and by night.

AD-258 581 Div. 1, 12
(26 June 61) OTS price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
CONDITIONS ON MODEL-REFERENCE ADAPTIVE SYSTEM

Division 1 - AIRCRAFT AND FLIGHT EQUIPMENT

INPUT SIGNALS FOR STABLE PERFORMANCE,
by J. J. Bongiorno, Jr. 17 Jan 61, 1v. incl. illus. 14 refs. (Research rept. no. PIBMRI-886-60)
(Contract AF 18(600)1505)
(AFOSR-571) Unclassified report

DESCRIPTORS: *Control systems, Flight, Feedback, Stability, Errors, Design, Differential equations, Tests, Linear systems, Non-linear systems, *Aircraft, *Guided missiles.

An approach to adaptive control system design which does not involve a direct measurement or identification of the variable process parameters is investigated. Convergence-time relationships and sufficient conditions for system stability are developed when the process is characterized by a variable gain or variable time-constant, and fixed dynamics of any order. The adaptive capability is achieved by employing a model as a reference element and by means of appropriate adaptive circuitry. The adaptive circuitry is simple, easily instrumented, and does not require successive differentiations; the primary function of the adaptive circuitry is one of integration. (Author)

AD-258 591 Div. 1, 25
(27 June 61) OTS price $1.00

Southampton U. (Gt. Brit.).
EXPERIMENTAL STUDY OF THE RANDOM VIBRATIONS OF AN AIRCRAFT STRUCTURE EXCITED BY JET NOISE,
by B. L. Clarkson and R. D. Ford. Rept. for July 59-Dec 60 on Metallic Materials. Mar 61, 32p. incl. illus. table.
(Contract AF 61(052)332, Proj. 7351)
(WADD TR 61-70) Unclassified report

DESCRIPTORS: *Vibration, *Airframes, Tests, *Jet engine noise, Resonance, Airplane panels, Fatigue (Mechanics), Stresses, Mathematical analysis, Analysis, Theory, Aircraft.

Recordings have been made of the strains induced in a full scale rear fuselage test structure of the Caravelle air-liner when one jet engine is running at maximum take-off thrust. The analysis has been concentrated on the strains in the centers of panels. Correlation measurements indicate that the larger panel strains occur above 500 c. with the frames acting as boundaries. The main resonance peak in each panel has been identified with the fundamental stringer-twisting mode but the mode-shapes for the two smaller peaks have not been completely determined. An attempt has been made to calculate the panel resonant frequencies theoretically. (Author)

AD-258 671 Div. 1, 22
(28 June 61) OTS price $2.60

Naval Weapons Lab., Dahlgren, Va.
DEVELOPMENT AND EVALUATION OF MARK 1 MOD 2 AND MARK 3 MOD 1 AIRCRAFT EJECTION SEAT CATAPULT CARTRIDGES,
by S. E. Hedden, F. W. Taylor and S. T. Fox. Final rept. Apr 57-Oct 58. 19 June 61, 1v. incl. illus. tables (NWL rept. no. 1758)
Unclassified report

DESCRIPTORS: *Ejection seats, Design, Catapults, Ignition, *Ejector cartridges, *Explosive actuators.

The development of an igniter system for the Mk 1 Mod 2 and Mk 3 Mod 1, cartridges which eliminates the pyralin booster cup of the Mk 1 Mod 0 and Mk 3 Mod 0, is described as are the determination of a new propellant charge and trap plate design. The procedures followed in qualification are described and results sumarized. (Author)

AD-258 681 Div. 1, 12, 30
(5 July 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
ANALYTICAL INVESTIGATION OF AN ADAPTIVE FLIGHT-CONTROL SYSTEM USING A SINUSOIDAL TEST SIGNAL,
by Jack E. Harris. June 61, 64p. incl. illus. tables (NASA Technical note D-909)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-909.

DESCRIPTORS: Automatic pilots, *Control systems, Stability (Longitudinal), *Flight simulators, Analog computers, *Control simulators, Mathematical analysis.

An analytical study was made of an adaptive flight-control system which measures vehicle response to small-amplitude control-surface deflections produced by a sinusoidal test signal. Changes in the response to this signal are related to environmental changes and the system is continuously altered to maintain this response equal to a preselected value. The effects on system performance of variation in flight condition, system gain level, test-signal frequency, and sensor location are included in the analysis. (Author)

AD-258 818 Div. 1, 5
(29 June 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AVIATION REVIEW (SELECTED ARTICLES).
23 Mar 61, 44p. incl. illus. (Trans. no. MCL-746 of Letovsky Obzor 4:pp. 34-36, 38-40, 44, 52-57, 1960).
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Airplanes, *Helicopters, Czechoslovakia, *Transport planes, Poland, *Radio equipment, Economics.

New Czechoslovak helicopter, HC-3, by Jaroslav Slechta: The helicopter is described and an explanation is given of its various uses in public health, agriculture, transportation, building construction and foreign trade. Radio equipment of the airplane, AN-10, by V. Verkovskij: Components of the radio equipment are described, and details are given on their use. Helicopters in the Soviet economy, by V. A. Kuznecov: Helicopters, such as the Mi-1, Mi-4, and Mi-6, are used for construction work, forestry, geological explorations, transportation, and agriculture. The transport plane, MD-12: This new Polish transport plane is described as a passenger or cargo plane with four WN-3 engines. Speaking about airplanes, by Jaromir Bohac: Soviet transport planes, AN-10, IL-18, TU-104, TU-110, and TU-114 are described and compared with their American and British counterparts.

AD-258 820 Div. 1, 33
(29 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRPLANES IL-18V ON CSA AIRWAYS,
by Milan Vyletal. 2 Mar 61, 14p. incl. illus. (Trans. no. MCL-750 of Letecky Obzor 4:230-233, 1960)
Unclassified report

DESCRIPTORS: *Transport planes, USSR, Technological intelligence, *Air transportation, Aircraft cabins, Fuselages, Turbopropeller jet engines, Design.

The Soviet transport plane IL-18V is described. This modern airplane is a low-wing monoplane with 4 propeller-driven turbojet engines, with pressurized cockpit and with a normal capacity of 78 passengers. The engine turbine is of the three-stage-type, with the turbine, compressor and propeller on the same shaft. The engine fuel is stored in 11 wing tanks on each side capable of holding over 5000 gals. Hydraulic systems are used for retractable landing gear, brakes, wipers, steering of landing gear, emergency brakes, and for emergency setting of propellers. There is no oxygen system for the passenger, but there are 10 portable oxygen bottles for their use. The passenger arrangements are such that the tourist accommodations are in front and just in back of the wing with restrooms in between. The first-class passengers are to the rear of the airplane with the buffet of kitchen facilities separating them from the tourist class. A table of statistics about the airplane's weight and speed is given.

AD-258 821 Div. 1, 2
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AVIATION REVIEW (SELECTED ARTICLES).
3 Mar 61, 21p. incl. illus. (Trans. no. MCL-752 of Letecky Obzor 4: pp. 102-103, 112-114, 1960)
Unclassified report

DESCRIPTORS: Czechoslovakia, *Electromagnetism, Electromagnetic fields, Measurement, *USSR, *Minerals, *Geological survey, Airborne, Electronic equipment, *Transport planes, *Jet planes, Technological intelligence, *Radio equipment.

Contents (A Journal from Czechoslovakia): Aeroelectromagnetic survey, by L. Artamonov. A description is given of the geological survey of useful minerals in the USSR from the air by the use of electromagnetic principles. Radio equipment of TU-114, by A. Delcov. The TU-114 is the gigantic Soviet jet transport plane which took Premier Nikita Khruschchev to the United States non stop.

AD-258 827 Div. 1, 21, 27
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DEVELOPMENT OF AIRCRAFT ENGINES IN THE USSR,
by V. Filip. 10 Feb 61, 8p. incl. illus. tables. (Trans. no. MCL-800 of Kridla Vlasti 9:24-26, 1960)
Unclassified report

DESCRIPTORS: *Aeronautics, *USSR, *Airplane engines, Design, Technological intelligence, History, Jet engines, Turbopropeller jet engines, Nuclear propulsion.

This translation contains a brief history of the development of aircraft engines in the USSR. The paper traces the development back to the first aircraft engine claimed to be developed there.

AD-258 832 Div. 1
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GIANTS (Gigaty),
by A. Shternfel'd. 13 Mar 61, 3p. (Trans. no. MCL-827 of Sovetskaya Rossiya 283: pp. 1, Dec 60).
Unclassified report

DESCRIPTORS: *Satellites, *Spaceships, USSR, *Satellite vehicles, *Satellite vehicle research, Rockets, Space probes, Space medicine, *Space flight.

AD-258 833 Div. 1, 2, 12
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HABITABLE ISLAND IN THE ETHER,
by N. Varvarov. 13 Mar 61, 6p. incl. illus. (Trans. no. MCL-828 of Ekonomicheskaya Gazeta 170: pp. 4, Dec 60)
Unclassified report

DESCRIPTORS: *Space flight, Spaceships, Moon, Velocity, Extraterrestial bases, Cosmic rays.

AD-258 834 Div. 1
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FASTER THAN SOUND (NEWS FROM ABROAD),
by M. Yurkevich. 13 Mar 61, 7p. incl. illus. (Trans. no. MCL-830 of Grazhdanskaya Aviatsiya: pp. 30-31, Oct 60)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Transport planes, *Supersonics, *Aerodynamic configurations, Triangular wings, Vertical take-off planes, Swept-back wings, Airplanes, Canard configurations.

Discussion considered the U. S. and British plans for supersonic transport aircraft. Demands for 1500-mph aircraft do not appear to warrant expenditures for planning and construction, so aircraft with flight speeds of over 1800 mph are consequently being considered. The delta wing and long narrow fuselage appear to provide excellent balancing at supersonic speeds. Convair, Douglas, Handley Page Co, and Rolls Royce Co. have designs for such supersonic planes. Vertical take-off and landing by rotating the engines

is part of the project for this ramjet aircraft, according to structural designs by the Bristol Co. British Vickers Armstrongs Co. announced plans for an aircraft with a wing of variable geometry-variable sweepback, called Swallow. Wings and engines both would rotate to provide better aircraft form for each flight condition and to eliminate ordinary control systems. Problems of range and fuel consumption are also considered.

AD-258 841 Div. 1
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LANDING IN MOUNTAINS,
by V. Shishkin. 31 Mar 61, 7p. (Trans. no. MCL-858 of Grazhdanskaya Aviatsiya 11:12-13, Nov 60).
Unclassified report

DESCRIPTORS: Mountains, *Landing, *Helicopters, Air, Density, Control systems, Air mass analysis, *Airplane landings.

AD-258 842 Div. 1
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WINGS,
by V. Parfenov. 31 Mar 61, 9p. incl. illus. (Trans. no. MCL-860 of Grazhdanskaya Aviatsiya 11:28-30, Nov 60)
Unclassified report

DESCRIPTORS: *Wings, USSR, Technological intelligence, Wing slots, Hypervelocity vehicles, *Airplanes, Jet planes, *Jet engines, Exhaust systems, Vertical take-off planes, *Swept wings.

Presented is a general account of aircraft wings from the envisioned, retractable folding wings for hypersonic aircraft to the flopping-wing aircraft resembling birds in flight. Evolution to wings from triplanes to the swept-back types of today is pointed out, as well as developments in various types of foreign VTO aircraft. Mention is also made of foreign experiments in pulling wings and jet wings. The pulling wing consists of small jet engines built into the wing along the wing span to fuse the engine and wings of the aircraft. The jet wing has a narrow slot in the trailing edge through which a stream of escaping engine gases are released at high speed to give greater lift and to lower the probability of flow collapse. For pylon-mounted engines the gas stream is directed toward the flaps to achieve this same effect.

AD-258 844 Div. 1, 33
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DEVELOPMENT TENDENCIES IN THE CONSTRUCTION OF TRANSPORT AIRCRAFT (Entwicklungstendenzen im Verkehrsflugzengbau).
7 June 61, 23p. incl. illus. (Trans. no. MCL-903 of Jahrbuch der Deutschen Luftfahrtforshung: pp. 57-66, 1960)
Unclassified report

DESCRIPTORS: *Transport planes, Germany, Technological intelligence, *Air transportation, Air speed, *Economics, Design, Turbines, Jet engines, Air traffic.

Developments in air transportation have resulted from changes in the design of airframes and from improvements and new concepts in engines. Each improvement increased the speed of transport airplanes. Cruising speed, range, and economy of operation are important considerations for understanding the progress in air transportation. Some of the highlights of this progress are mentioned. Future uses for transport aircraft depend upon many things. Planning is important since a number of years are required to develop an operational airplane. Statistics on passenger and cargo traffic must be studied. Quantities of types of existing airplanes and engines indicate future needs. Research in airframes and engines reveals possible new developments, such as atomic energy propulsion, plasma-jet engines, ion-jet engines, and photon jets. All these are indications for the future.

AD-258 888 Div. 1, 12, 19
(30 June 61) OTS price $1.60

Convair, San Diego, Calif.
PROPOSAL FOR STUDY OF ANALYSIS METHODS FOR NON-LINEAR AUTOPILOT SYSTEMS.
6 Jan 61, 15p. incl. illus. (Rept. no. ZU-066)
Unclassified report

DESCRIPTORS: *Automatic pilots, *Servo systems, Mathematical analysis, Differential equations, Complex variables, Operational calculus.

This proposal is for the continuation of AF 33(616)7371 to apply Russian analytical techniques to a typical pitch-rate autopilot and a pitch-rate autopilot with self evaluating loop. For the first autopilot the simplifications and assumptions for analysis are described and the method of solution of the equations is outlined. This autopilot will also be analyzed by an approximation method and use will be made of digital programs. In order to attach the second autopilot analytically, the approach will necessitate considerable research work in the realm of differential equations with time dependent coefficients for which approximate solutions are to be constructed by approved approximation methods. Some of the principles in the theory of approximation to which Russian mathematicians have made serious contributions will be used. This work will be supported and checked by analog and digital computational procedures.

AD-258 983 Div. 1
(5 July 61) OTS price $3.60

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE,
by C. V. Lassmann. Interim rept. no. 11, 1-30 Apr 61. 8 May 61, 1v. incl. illus. (Engineering rept. no. 4137)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: *Refueling in flight, Aircraft, Airplanes, Airplane protuberances, Aircraft equipment, Flight testing, Booms, Design, Towed bodies, Bombers.

Flight tests were conducted which included a total of 49 simulated refueling contacts by 5 different types of Navy aircraft. During these contacts, the store demonstrated excellent features of formating position and response characteristics, and results of the evaluation appear to be very favorable. Additional activities during the month of April have consisted of continued development of the prototype store, including detail design, structural analysis, procurement, tooling, fabrication, flutter investigation and detail compatibility analysis. (Author)

AD-258 984 Div. 1
(5 July 61) OTS price $1.10

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE,
by C. V. Lassmann. Interim rept. no. 12, 1-31 May 61. 8 June 61, 5p. (Engineering rept. no. 4154)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: *Refueling in flight, Aircraft, Airplanes, Airplane protuberances, Aircraft equipment, Flight testing, Booms, Design, Towed bodies, Bombers, Fuel pumps.

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-258 359 Div. 2, 1, 25
(19 June 61) OTS price $1.60

Minnesota U. School of Physics, Minneapolis.
BALLOON FLIGHT RECORD STATUS REPORT AS OF 30 DECEMBER 1960,
by John R. Winckler. May 61, 11p. incl. tables. (Sponsored by National Science Foundation, National Aeronautics and Space Administration, and Office of Naval Research)
Unclassified report

DESCRIPTORS: *Balloons, Bremsstrahlung, Flight, *Cosmic rays, Solar flares, Time, Instrumentation, *Geophysics.

The flights during this period covered the great series of geophysical events in November 1960. Because of the large amount of data, only very preliminary results are presently available. The table gives the flight number, launch time, launch location, duration, and type of instrumentation used on each of the flights. The flight duration is measured from launch time. The floating-pressure altitude of the current balloon system is 6 mb. In general, the flights attain this altitude about 2 hr after the stated launch time. The balloons do not always float at a constant altitude, however, so that the detailed time-pressure curve for each flight is necessary for final analysis. An index for the types of instruments used is attached at the end of the tabulation. (Author)

AD-258 377 Div. 2, 32
(29 June 61) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
LUNAR ATMOSPHERE AND SURFACE CONDITIONS. AN ANNOTATED BIBLIOGRAPHY,
comp. by George R. Evans. May 61, 27p. (Special bibliography no. SB-61-22; Rept. no. LMSD 3-10-61-1)
Unclassified report

DESCRIPTORS: *Bibliography, Atmosphere, *Moon, Surfaces, Theory, Lunar probes, Infrared radiation, Telescopes, Thermal radiation, *Planetary atmospheres.

The primary concern of this search was to collect information on the theory of the atmosphere and surface of the moon; also, emphasis was placed on data derived from experiments and investigations. This search and a companion one, Lunar Probes and Landings, LMSD-5-10-61-3/SB-61-24 were undertaken to support studies of an eventual lunar landing. The period covered is from January 1959 to the present. (Author)

AD-258 382 Div. 2
(30 June 61) OTS price $1.60

Canterbury U. (New Zealand).
THE IDENTIFICATION OF METEOR SHOWERS WITH APPLICATION TO SOUTHERN HEMISPHERE RESULTS,
by C. Ellyett, C. S. L. Keay and others.
10 Apr 61, 18p. illus. tables (Scientific rept. no. 2)
(Contract AF 64(500)6)
(AFCRL-321)
Unclassified report

DESCRIPTORS: *Meteors, Astrophysics, Meteorites, Identification, Radar, Dectection, New Zealand, *Astronomy.

Further meteor shower results observed by radar at Christchurch, New Zealand, are given including results at high rates, and data are compared with visual observations and radar results from Adelaide for the declination range from +26 degrees .5 to about -50 degrees. Seven meteor showers appear in all three surveys, and can be regarded as certain and another 6 to 9 which are each reported twice are probable. An additional 9 to 10 radiants, however, are found by each survey alone. The technique of shower identification depends partly on the nature of the background rate, which may be due either to sporadic meteors or to the resultant of many minor radiants. The resolution of this uncertainty is necessary before the occurrence of less active showers can be confirmed. The rate-count method has been extended to multiple range bands, resulting in a useful additional means of sorting out the significance of peaks in the rate curves. (Author)

AD-258 400 Div. 2
(26 June 61) OTS price $1.10

American Meteorological Society, Boston, Mass.
THE RECENT DESTRUCTION OF SEMENOVSKII ISLAND (O Razrushenii Ostrova Semenovskogo za Poslednie Gody),
by Ia. P. Koblents, tr. by Burton J. Hobson.
Feb 61, 2p. incl. illus. (Trans. no. T-R-350 of Problemy Arktiki 5:125-127, 1958)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: *Deltas, Tidewater, *Erosion, Ocean waves, Deterioration, Geophysics, Arctic regions, Siberia.

AD-258 401 Div. 2, 6
(26 June 61) OTS price $1.10

American Meteorological Society, Boston, Mass.
STRUCTURE OF THUNDERSTORM SHOWERS, ACCORDING TO DATA ON THE INTENSITY DISTRIBUTION OF RADIO-ECHOES WITH HEIGHT (Struktura Grozovykh Livnei po Dannym o Raspredelenii Intensivnosti Radio-ekho s Vysotoi),
by L. M. Markovich and V. M. Muchnik, tr. by Burton J. Hobson. Jan 61, 2p. (Trans. no. M-RA-6 of Ukrainskyi Fizychnyi Zhurnal 5(2):268-269, 1960)
(Contract AF 19(604)6113)

Unclassified report

DESCRIPTORS: Storms, *Precipitation, Intensity, Raindrops, Hail, Distribution, *Radar analysis, Radar echo areas, Height finding.

AD-258 402 Div. 2, 1
(26 June 61) OTS price $1.60

American Meteorological Society, Boston, Mass.
THE METEOROLOGICAL CONDITIONS OF ICING IN St AND Sc CLOUDS (Meteorologicheskie Usloviia Obledeneniia v Oblakakh Tipa St i Sc),
by A. I. Voskresenskii, K. I. Chukanin, tr. by Burton J. Hobson and David Kraus. Feb 61, 17p. incl. tables (Trans. no. T-R-348 of Leningrad. Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Trudy, 228(1):124-134, 1959)
(Contract AF 19(604)6113)

Unclassified report

DESCRIPTORS: *Aircraft, *Ice, Stratus clouds, Flight, Climatic factors, *Meteorological data, Arctic regions, USSR.

Results are given of the processing and analysis of data on the meteorological conditions of aircraft icing during flights in St and Sc clouds in the Arctic. Aircraft icing occurs primarily during flights in clouds; cases of clear-sky icing are rare. Some of the characteristics of St and Sc clouds are examined. (Author)

AD-258 403 Div. 2, 30
(26 June 61) OTS price $1.60

American Meteorological Society, Boston, Mass.
ORGANIZATION AND METHOD OF INVESTIGATING FOG AND CLOUDS (Organizatsiia i Metodika Issledovanii Tumanov i Oblakov),
by A. I. Voskresenskii, tr. by Burton J. Hobson. Dec 60, 13p. incl. illus. (Trans. no. T-R-343 of Leningrad, Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Trudy 228:5-13, 1959)
(Contract AF 19(604)6113)

Unclassified report

DESCRIPTORS: *Fog, *Clouds, Sources, Physical properties, Reduction, Meteorological data, Arctic regions, Recording devices, Atmosphere, Aircraft, Collecting methods, *Scientific research.

The basic stages of the organization and method of research of the Arctic Institute expedition are presented. The basic assignments of the expedition were: (1) The carrying out of a wide meteorological, microphysical and aerological complex of observations of fog and clouds both from the ground and from aircraft, (2) The execution of experiments on the artificial seeding of supercooled lower-level clouds and fog using dry ice and silver iodide, (3) The organization of stationary observations of fog according to a special program in the Arctic observatories at Dickson Island, Tiksi and Pevek in 1956 - 1957, and (4) The setting up of bases for conducting aerological investigations on Dickson Island and at Tadibe-Yakha in 1957. (Author)

AD-258 404 Div. 2
(26 June 61) OTS price $2.60

American Meteorological Society, Boston, Mass.
THICKNESS OF THE EARTH'S CRUST AS A FUNCTION OF THE AGE OF FOLDING (Zavisimost' Moshchnosti Zemnoi Kory ot Vozrasta Skladchatosti),
by R. M. Demenitskaia, tr. by Roy Flagg. Oct 60, 21p. incl illus. tables (Trans. no. T-R-338 of Sovetskaia Geologiia, 6:3-23, 1958)
(Contract AF 19(604)6113)

Unclassified report

DESCRIPTORS: *Earth, Thickness, Surface properties, *Geological survey, *Geological time, Oceans, Mountains, Geology.

AD-258 406 Div. 2
(26 June 61) OTS price $1.60

American Meteorological Society, Boston, Mass.
THE INFLUENCE OF THE CENTRAL ASIATIC MOUNTAIN MASSIF ON THE FORMATION OF JET STREAMS (Vliianie Tsentral'Noaziatskogo Gornogo Massiva na Fornirovanie Struinykh Techenii),
by Kh. P. Pogosian and K. F. Ugarova, tr. by Richard M. Holden. Mar 61, 14p. incl. tables. (Trans. no. T-R-346 of Meteorologiia i Gidrologiia 11:16-26, 1959)
(Contract AF 19(604)6113)

Unclassified report

DESCRIPTORS: *Jet streams (Meteorology), Sources, *Mountains, Air mass analysis, Meteorological data, Asia.

A study is made of the influence of mountain ridges, primarily the Central Asiatic mountain massif, on the formation, change of intensity and seasonal position of tropospheric jet streams. The Himalayas and Tibet are considered to exert an essential influence on atmospheric circulation aloft, and at the same time, on the jet streams. In regards to the effect of this mountain massif on atmospheric circulation in the lower half of the troposphere and on the weather in China and northern India, it is shown that Tibet and the Himalayas are active mainly during the cold part of the year and exert almost no influence during the warm season. This is due to the fact that by summer the upper frontal zone and the jet stream converge to the north beyond the limits of this highland. According to these concepts, the western air current (the jet stream) bifurcates during the cold half-year when it encounters the mountain massif. As a result of the mechanical effect of the mountains, there are, two jet streams, north and south of the mountains. The northern branch of the jet stream is more mobile than the southern, since the movement of the southern branch is restricted by the Himalayas. (Author)

AD-258 407 Div. 2
(26 June 61) OTS price $2.60

American Meteorological Society, Boston, Mass.
AEROLOGICAL CHARACTERISTICS OF SEA FOG (Aerologicheskie Charakteristiki Morskikh Tumanov),
by P. A. Vorontsov, tr. by Burton J. Hobson. Dec 60, 22p. incl. illus. tables (Trans. no. T-R-342 of Leningrad. Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Trudy 228:38-54, 1959)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: *Fog, Sources, Arctic regions, Wind, Sea breeze, Temperature inversion, Meteorological data.

AD-258 408 Div. 2, 1, 9
(26 June 61) OTS price $1.10

American Meteorological Society, Boston, Mass.
AN ACCURATE DEFINITION AND USE OF THE RICHARDSON NUMBER FOR IDENTIFICATION OF THE ZONES OF AIRCRAFT BUMPINESS (Utochnenie i Ispol'zovanie Chisla Richardsona Dlia Vyiavleniia Zon Boltanki Samoletov),
by M. V. Zavarina and M. I. Iudin, tr. by Richard M. Holden. Oct 60, 10p. (Trans. no. T-R-334 of Meteorologiia i Gidrologiia 2:3-10, 1960)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: *Atmosphere, *Aircraft, Turbulence, *Gust loads, Determination, Identification, Numerical methods and procedures, Wind, Climatic factors.

The widespread concept that bumpiness can occur only due to turbulence is not entirely accurate. Wave motions at the surfaces of separation can also be a cause of bumpiness. Waves can cause appreciable aircraft oscillations in cases when the time that a plane flies a distance equal to the wavelength, is close to the period of free oscillations of the aircraft (the resonance phenomenon). Special investigations of well-regulated vertical motions are desirable from the point of view of their influence on aircraft oscillations. Despite these exceptions, the sphere of applicability of the Ri number is broad and the Richardson criterion in our modified form (Ri)y is useful for estimating the level of turbulent energy and the appearance of aircraft bumpiness associated with it. (Author)

AD-258 450 Div. 2
(21 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON SOME PHENOMENA OF THE ELEVEN-YEAR CYCLE OF THE SUNS ACTIVITY (O Nekotorykh Geograficheskikh Proyavleniyakh Odinnadtsatiletnego Tsikla Solnechnoy Aktivnosti),
by I. V. Maksimov. 16 Dec 60, 34p. incl. illus. tables (Trans. no. MCL-68 from Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya 1:pp. 15-32, 1954)
Unclassified report

DESCRIPTORS: *Sun, Earth, Climatic factors, Geography, Oceans, Glaciers, Northern hemisphere, USSR.

Contents:
On some geographical phenomena of the eleven-year cycle of the sun's activity
On eleven-year fluctuations of the average annual volume of precipitation in western Europe
Regarding the eleven-year periodic fluctuations of the average sea level in the oceans of the world
On eleven-year fluctuations in the glacial condition in the northern part of the Atlantic Ocean
On variations of magnitudes of eleven-year fluctuations in solar activity.

AD-258 501 Div. 2, 25,
(19 June 61) OTS price $7.60

Minnesota U. School of Physics, Minneapolis.
A STUDY OF AURORAL X-RAYS AT MINNEAPOLIS BETWEEN 23 AUGUST 1959 AND 1 AUGUST 1960,
by Thomas C. May. Apr 61, 64p. incl. illus. tables (Technical rept. no. CR-36)
(Sponsored by Office of Naval Research)
Unclassified report

DESCRIPTORS: *Aurorae, *X-rays, Photons, Electrons, Bremsstrahlung, Terrestrial magnetism, *Magnetic storms, Measurement, Recording devices, Airborne, Ballons.

Auroral X-ray bursts observed in a balloon monitoring project are presented. To make a reasonable presentation of the bursts, it is necessary to determine something about the intensity and energy spectrum of the electrons producing the x-rays. Calculations are presented which show that the electron flux distribution which causes auroral x-rays is much more intense at low energies than at high energies. For example, if the electron flux distribution is of the form kE to the -nth power, n must be about 3 or 4. Calculations are then made of the average electron flux above 20 kev for each burst, assuming that the flux distribution is of the form kE to the -3 power and that the electrons are impinging on the top of the atmosphere over a large area above the balloon. Laboratory experiments are presented which verify most of the procedures used in the calculations. Finally, there are some calculations of the possible magnetic effects of the bremsstrahlung-producing electrons. (Author)

AD-258 506 Div. 2
(21 June 61) OTS price $1.10

Hydrographic Office, Washington, D. C.
OPERATION DEEP FREEZE 61 MARINE GEOPHYSICS OBSERVATIONS.
6 June 61, 3p. incl. illus. table (Serial 3962)
Unclassified report

DESCRIPTORS: *Geophysics, *Terrestrial magnetism, Bathythermographs, *Oceanography, Antarctic regions, Hydrographic surveying, Oceanographic vessels, Oceanographic data.

Marine geophysical research in the Antarctic during the Austral summer of 1960-61 is described. A broad program consisting of terrestrial magnetism, bathymetry, and oceanography was accomplished aboard USS STATEN ISLAND (AGB-5). Oceanographic observations were obtained from USS EDISTO (AGB-2), and supplementary observations were obtained from USS GLACIER (AGB-4), USCGC EASTWIND (WAGB-279), and USS WILHOITE (DER-397). In addition, the project entitled Shore-Based Seasonal Oceanographic Studies at McMurdo Sound was completed. (Author)

AD-258 549 Div. 2
(26 June 61) OTS price $11.00

Air Force Cambridge Research Labs., Bedford, Mass.
A STUDY OF THE PULSATING GROWTH OF CUMULUS CLOUDS,
by Charles E. Anderson. Dec 60, 136p. incl. illus. tables, 59 refs. (AFCRL TR 60-417; Geophysical research papers no. 72)
(Proj. 8620) Unclassified report

DESCRIPTORS: *Cumulus clouds, Turbulence, Air mass analysis, Ai, Turbulent flow, Statistical analysis, Aerial photography, Mapping, Clouds, Growth, *Convection.

The growth of five cumulus congestus clouds over the Santa Catalina Mountains near Tucson, Arizona, was subjected to detailed examination by means of photogrammetric and statistical analysis. These clouds were found to exhibit a pulsating form of cellular convection as they grew upward. Once maximum height was achieved, the circulation became a linearly-increasing function of time. The pulsations were found to be related to the buoyancy-restoring force of the statically stable air with frequencies near 10 minutes. Higher frequencies were found near one to two minutes which could not be definitely accounted for by conventional turbulence theory. An overall acceleration of the motion was shown to be caused by an underlying flow which responded to the mean state of the cloud column. A physical model is proposed for the circulation of a growing cumulus in which two cells are acting concurrently, yet independently, along the same vertical axis. The correct time behavior is shown to result from applying Bjerknes' circulation theorem, modified to include entrainment and mixing. (Author)

AD-258 558 Div. 2
(27 June 61) OTS price $2.60

Hawaii Inst. of Geophysics, Honolulu.
THE SUBTROPICAL CYCLONE,
by C. S. Ramage. Apr 61, 26p. incl. illus. tables (Scientific rept. no. 1; Rept. no. 15)
(Contract AF 19(604)6156)
(AFCRL-489) Unclassified report

DESCRIPTORS: *Cyclones, Tropical regions, Air mass analysis, Meteorological data, Wind, Aerial photographs, Satellite vehicles, Meteorology.

Upper level cut-off cyclones, first identified in middle latitudes, are found as well in lower latitudes where they often extend to the surface and persist for long periods. On 4 April 1960, TIROS I photographed a portion of a near steady-state subtropical cyclone over the eastern Pacific. Composited surface and upper air observations of the cyclone, when combined with the photographs, presented a sketchy but consistent picture of the circulation. A subtropical cyclone which developed near Lihue in February 1951 provided additional details, particularly of the important stability and weather changes accompanying cut-off. The two cases form the foundation for a subtropical cyclone model. Development occurs as in middle latitudes. The mature cyclone, which approximates horizontal symmetry, comprises a direct subsiding circulation in the lower troposphere, separated by a subsidence inversion from a trade wind-like regime in the surface layers. Because of its energy exporting character and the insignificant effect of surface friction, a subtropical cyclone apparently does not decay, being usually absorbed by a large amplitude trough in the polar westerlies. (Author)

AD-258 599 Div. 2, 6
(27 June 61) OTS price $8.10

Washington U., Seattle.
A STUDY OF SQUALL LINE FORMATION IN TWO CASES,
by Richard J. Reed and Gene D. Prantner. May 61, 82p. incl. illus. table (Scientific rept. no. 1)
(Contract AF 19(604)5192)
(AFCRL-211) Unclassified report

DESCRIPTORS: *Meteorology, Radar analysis, *Air mass analysis, Meteorological charts, Tables, *Radar echo areas, Climatic factors, North America, Test methods.

This analysis was conducted to determine the mechanism of squall line formation and movement in two separate cases. These cases were selected because of the availability of composite radarscope photographs giving accurate descriptions of the developments, and because at the time of selection it was believed that they furnished excellent examples of nonfrontal squall lines. (Author)

AD-258 600 Div. 2
(27 June 61) OTS price $4.60

Washington U., Seattle.
PRELIMINARY RESULTS OF A STUDY OF PACIFIC STORM SYSTEMS USING 1.87 cm RADAR,
by Carl W. Kreitzberg. May 61, 44p. incl. illus. tables (Technical note no. 1)
(Contract AF 19(604)5192)
(AFCRL TN 60-698) Unclassified report

DESCRIPTORS: *Meteorology, *Air mass analysis, Meteorological charts, *Radar analysis, Radar echo areas, Climatic factors, North America, Tables, *Storms.

A study of the relationships between echoes received from vertically-directed, 1.87 cm radar and synoptic scale weather features is being conducted. This analysis covers the first seven months of study on the synoptic features, primarily the Pacific occlusions, and the first three months of radar operations. The techniques are discussed and the preliminary results are given. Synoptic data, including a time-section, are compiled and then compared with the radar information. The radar echoes are photographically recorded on a time-height trace and classified into echo types by means of criteria developed. The establishment of a satisfactory echo classification system is difficult, but even more difficult is the choice of synoptic scale weather parameters to which the radar echoes should be related. (Author)

AD-258 613 Div. 2
(26 June 61) OTS price $2.60

American Meteorological Society, Boston, Mass.
THE GROWTH OF A CHARGED WATER DROP IN A CLOUD AT

TEMPERATURES ABOVE FREEZING (L'evolution d'une goutelette d'eau chargee dans un nuage a temperature positive),
by R. Cochet, tr. by Elizabeth B. Reece. Oct 60, 22p. incl. illus. (Trans. no. T-F-34 of Annales de Geophysique 8:33-54, 1952)
(Contract AF 19(604)6113)

Unclassified report

DESCRIPTORS: Clouds, *Moisture, *Drops, Growth, Fog, *Electric potential, Falling bodies, Ionization potentials, Ionization, Temperature.

To study the growth of an electrized water drop in a cloud at positive temperature, first the different methods to determine the collection coefficient of an electrized water drop are considered, and the growth of this drop placed in a fog is examined. The general collection theory was verified in the particular case of cylinders, and the trajectories of the fog drops near an electrically charged cylindrical conductor were photographed. In seeding neutral clouds with electrized water drops (whether it be artificial electrization or phenomena of natural electrization), calculation shows that: (1) the diameter of small electrized water drops increases rapidly in a small space; and (2) the electrization of the water drops can only in general act efficiently on the initial phenomenon before releasing precipitation. (Author)

AD-258 656 Div. 2
(28 June 61) OTS price $2.60

Geophysics Corp. of America, Bedford, Mass.
SOME MEASUREMENTS OF THE COEFFICIENT OF DIFFUSION IN THE UPPER ATMOSPHERE,
by E. Manring and H. Knaflich. Mar 61, 21p. incl. illus. tables (GCA Technical rept. no. 61-3-N)
(Contract NAS5-215)

Unclassified report

DESCRIPTORS: *Upper atmosphere, Diffusion, Sodium, Vapors, Density, Photographic analysis, Tests, Research test vehicles, Potassium, Twilight, Wind.

Sodium vapor has been used as a trace element in many upper atmospheric experiments. The vapor is ejected from a rocket during twilight conditions so that sunlight is incident upon the cloud at times when the sky background is as low as possible. Under these conditions, photography of the cloud motion and growth is possible. The necessary expansion models and experimental techniques used to relate the photographed cloud dimensions to the coefficient of diffusion are discussed, and data obtained from three experiments is presented. (Author)

AD-258 657 Div. 2
(28 June 61) OTS price $2.60

Geophysics Corp. of America, Bedford, Mass.
PHOTOGRAPHY OF LUMINOUS EXTENDED OBJECTS AGAINST A TWILIGHT SKY,
by R. J. Levy and E. R. Manring. Mar 61, 19p. incl. illus. tables (GCA Technical rept. no. 61-4-N)
(Contract NAS5-215)

Unclassified report

DESCRIPTORS: *Upper atmosphere, *Photographic analysis, Photographic filters, Photographic film, Sodium, Lithium, Potassium, Vapors, Density, Diffusion, Wind, Twilight, Tests.

Clouds of sodium, lithium, and potassium vapor are used to determine wind velocity and the coefficient of expansion for various heights in the upper atmosphere. These materials scatter sunlight radiation incident upon the cloud by a resonance process. The resulting scattered light is nearly monochromatic and is characteristic of the scattering atom. The vapor is released from a carrier-rocket during twilight periods at times when the cloud will be sunlit, but the background will be as low as possible. For optimum photographic registration of the cloud characteristics, filters and film types are used to augment as far as possible the ratio of light scattered by the cloud to background light. A discussion of filter and film types for discrimination of the various wavelengths is given. Developing techniques to insure the required contrast and photographic latitude are considered. Film calibration and processing for subsequent densitometry is described. Consideration is given to the changing background intensities encountered during twilight, and to the optimum exposure under these various conditions. (Author)

AD-258 661 Div. 2, 26
(28 June 61) OTS price $18.50

Hughes Tool Co., Houston, Tex.
PRELIMINARY FEASIBILITY STUDY OF DRILLING A HOLE ON THE MOON.
Final technical rept. 23 Sep 60, 1v. incl. illus.
(Reorder no. 60-507)
(Subcontract to Jet Propulsion Lab., Calif. Inst. of Tech., Contract NASw-6)

Unclassified report

DESCRIPTORS: *Moon, Exploration, *Drilling machines, Surface area, *Lunar probes, Spaceships, Reliability, Drills, Surface properties, Physical properties, Load distribution, *Geology, Power supplies, Hammers, Diamonds, Analysis.

Research was concerned with the feasibility of drilling a hole on the moon. The preliminary feasibility study showed that of every known proven drilling method and many untried methods, percussion drilling will be the most suitable for Lunar drilling, where the weight and space requirements are limited for the first drill-equipped Lunar craft. Study indicated that the mechanical simplicity of the rotary system should give it a reliability advantage for small diameter (1/2 in.) holes which are less than 5 feet deep. Conversely, deeper holes and holes of 3/4 to 4 in. diameter can best be made by a percussor. For heavier space craft of the future where deep holes larger than 4 in. diameter are desirable, it is almost certain that rotary drilling with rolling cutter bits will have many advantages. (Author)

AD-258 712 Div. 2
(29 June 61) OTS price $1.60

American Meteorological Society, Boston, Mass.
NUMERICAL FORECASTING OF HUMIDITY, CLOUDINESS

AND PRECIPITATION BY MEANS OF A COMPUTER (Opyt Chislennogo Prognoza Vlashnosti, Oblachnosti i Osadkov na Vychislitel'noi Mashine),
by P. K. Dushkin, E. G. Lomonosov, and Iu. N. Lunin, tr. by David Kraus. Mar 61, 11p. incl. illus. tables (Trans. no. T-R-347 of Meteorologiia i Gidrologiia 12:3-10, 1960)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: *Weather forecasting, *Clouds, *Precipitation, Humidity, Barometric pressure, Climatic factors, Numerical analysis.

Advances were made in numerical forecasting of the pressure fields at several levels in the free atmosphere. These forecasts were based on the solution of hydrothermodynamic equations in quasigeostrophic, adiabatic and quasiadiabatic approximations. The quality of the pressure field forecasts can be raised through systematic elimination of these assumptions. Within the framework of the current, comparatively simple numerical systems of computing pressure, one can forecast a number of meteorological elements: vertical currents, humidity, cloud cover and precipitation. A first attempt is made to solve the problem of forecasting cloudiness and precipitation based on precomputation of the pressure, vertical current and humidity fields. (Author)

AD-258 738 Div. 2, 20
(30 June 61) OTS price $6.60

Maryland U., College Park.
GEOMAGNETICALLY TRAPPED ELECTRONS FROM COSMIC RAY ALBEDO NEUTRONS,
by A. M. Lenchek, S. F. Singer, and R. C. Wentworth. May 61, 1v. incl. illus. tables.
(Contract AF 49(638)530)
(AFOSR-877)
Unclassified report

DESCRIPTORS: *Albedo, *Cosmic rays, *Neutrons, Radioactive decay, *Electrons, Injection, Electron capture, Magnetic fields, *Terrestrial magnetism.

The ability of the cosmic ray neutron albedo mechanism to account for geomagnetically trapped electrons is investigated quantitatively. Injection as a function of energy, pitch angle and altitude is computed from a reasonable neutron albedo model. Loss mechanisms based on Coulomb interactions with the residual atmosphere are considered to act both independently and simultaneously. Slowing down is generally dominant. The electron belt which results has (a) an intensity whose energy spectrum shows a sharp peak at approximately 200 kev, (b) an angular distribution which is approximately isotropic up to the loss cone and (c) an omnidirectional, integral intensity in the geomagnetic equatorial plane which is approximately constant vs. altitude. The effect of the Capetown magnetic anomaly is shown to produce a slot of only 2% in the equatorial plane. Only a small fraction of the trapped electrons can be accounted for in terms of neutron albedo, essentially all trapped electrons exceeding 400 kev. An auroral component of low energy electrons is also present. (Author)

AD-258 792 Div. 2
(30 June 61) OTS price $4.60

California U., Los Angeles.
PRELIMINARY STUDY OF NUMERICAL ERRORS IN THE INTEGRATION OF BAROTROPIC FLOW ON A SPHERICAL GRID,
by W. Lawrence Gates and Christopher A. Riegel. 15 Mar 61, 46p. incl. illus. tables (Scientific rept. no. 4)
(Contracts AF 19(604)4965 and AF 19(604)6149)
(AFCRL-476)
Unclassified report

DESCRIPTORS: *Meteorological charts, Meteorological data, *Air mass analysis, *Meteorology, Errors, Barometric pressure, Vortices, Gas flow, Atmosphere models.

The barotropic vorticity equation for horizontal non-divergent flow is integrated numerically over the northern hemisphere on a spherical grid. The relative sensitivity of the tendency solutions at t equals 0 to the value of the over-relaxation coefficient A and the residue tolerance T is investigated in detail. The value A equals 0.36 is found appropriate for the extrapolated-Liebmann procedure, and a value of T corresponding to 0.07% of the maximum true stream function tendency appears reasonable for the basic 5 deg grid. Variations of A from 0.28 to 0.44, and of T by a factor of 100 produced about 8% variation in the magnitude of the maximum error for stream function tendency. In a series of integrations to 48 hr, the value of the time increment was varied from 1/4 hr to 3 hr, producing a variation in the magnitude of the maximum error of about 5%. (Author)

AD-258 797 Div. 2, 25
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE THEORY OF THE SOLAR CORONA (K Teorii Solnechnoy Korony)
by S. B. Pikel'ner. 26 Apr 61, 33p. incl. tables, 20 refs. (Trans. no. MCL-313 of Izvestiya Krymskoy Astrofizicheskoy Observatorii 5:34-58, 1950).
Unclassified report

DESCRIPTORS: *Solar corona, Theory, Plasma physics, Electric discharges, Gas dischargers, *Solar atmosphere, Particles, Protons.

AD-258 800 Div. 2, 25
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HERALD OF THE LENINGRAD UNIVERSITY. MATHEMATICS, MECHANICS AND ASTRONOMY SERIES (SELECTED ARTICLES).
26 Apr 61, 27p. incl. tables (Trans. no. MCL-58 of Vestnik Leningradskogo Universiteta 13; Seriya Matematiki, Mekhaniki, I Astronomii 3: pp. 124-138, 1956)
Unclassified report

DESCRIPTORS: *Astronomy, *Astrophysics, Spectrophotometers, Ionization, Excitation, Heavy elements, *Solar atmosphere, Interstellar matter, Solar spectrum.

Contents:
Spectrophotometry of the faculae in active areas in 1955
Ionization and excitation of heavy elements in solar and stellar atmosphere

AD-258 839 Div. 2
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE REVERSE SIDE OF THE MOON,
by A. Mikhaylov. 29 Mar 61, 4p. (Trans. no. MCL-853 of Pravda 321 (15445) pp. 6, 16 Nov 60)
Unclassified report

DESCRIPTORS: *Moon, *Photographs, Lunar probes, USSR.

AD-258 847 Div. 2, 25, 30
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MYSTERY OF LIGHTNING,
by N. Dobrovitskiv. 27 Apr 61, 5p. (Trans. no. MCL-936 of Trud 293 (12157) p. 4, 14 Dec 60)
Unclassified report

DESCRIPTORS: USSR, *Lightning, Laboratories, Scientific research.

AD-258 884 Div. 2
(3 July 61) OTS price $2.60

Allied Research Associates, Inc., Boston, Mass.
THE MOTION AND PREDICTABILITY OF STRATIFORM PRECIPITATION,
by Roland J. Boucher. 1 Feb 61, 25p. incl. illus. tables (Scientific rept. no. 7)
(Contract AF 19(604)5204)
(AFCRL-276) Unclassified report

DESCRIPTORS: *Precipitation, *Weather forecasting, Detection, Motion, Meteorology, Radar, Analysis, Tests, Simulation.

Analysis of the motion of the edges of sheets of uniform precipitation as viewed on radar, indicates that the velocity of advance of the edge (measured perpendicular to the edge) is a reasonably conservative quantity. The speed appears unrelated to the observed wind component in the direction of advance at any level or combination of levels; however, the orientation of the edge is such that the direction of advance generally lies to the right of the upper winds. The motion of elements within the precipitation sheets is closely related to the direction of the wind at the 700 mb level. The empirical probability of precipitation reaching a given point is derived in terms of the estimated travel time of the precipitation. The probability is significantly higher, for the same travel time, than that previously derived for precipitation lines. Simulated forecast tests of the predictability of the edge motion for periods of 2 to 6 hr indicate that in 74% of the trials the error in timing the arrival of precipitation amounted to 30% or less of the forecast period, and that these values changed little as the length of the forecast period increased. (Author)

AD-258 919 Div. 2, 20
(3 July 61) OTS price $1.60

Lamont Geological Observatory, Palisades, N. Y.
(No title).
Final rept. 16 July 58-28 Feb 61. 15 May 61, 12p.
(Contract AF 19(604)4144)
(AFCRL-662) Unclassified report

DESCRIPTORS: *Seismic waves, *Wave transmission, Microseisms, Propagation, Explosions, Earthquakes, Mathematical analysis, Nuclear explosions.

In seismic wave propagation, waves of the second shear mode were observed, apparently for the first time and the shorter period oceanic surface waves with motion on all three recording components were explained as a combination of the Love and first shear modes. Free periods of oscillation of the earth were observed and reported. The so-called leaking modes which result in the PL wave and in the long-period trains following S, SS, etc., were explained qualitatively. One study of particular interest was that of the radiation pattern of the southeast Alaska earthquake where amplitudes and phase as a function of azimuth showed a strong dependence on fault orientation. Long-period microseisms were studied. Long-period waves both of the expected and unexpected types were recorded from nuclear explosions in the air (near surface and high altitude shots), in the water and underground at the Nevada Test Site. Of particular interest are the Love waves from the Russian explosions and the inversely dispersed Rayleigh waves observed at Honolulu from the high-altitude shots. (Author)

AD-258 958 Div. 2, 3
(30 June 61) OTS price $5.60

Aerosol Lab., Stanford U., Calif.
SURVEY OF THE AVAILABLE INFORMATION PERTAINING TO THE TRANSPORT AND DIFFUSION OF AIRBORNE MATERIAL OVER OCEAN AND SHORELINE COMPLEXES,
by David T. Prophet. June 61. 53p. incl. illus. tables, 75 refs. (Technical rept. no. 89)
(Contract DA 42-007-403-cml-448)
Unclassified report

DESCRIPTORS: *Aerosols, Diffusion, Terrain, Oceans, *Bibliography, Meteorology, *Clouds.

Literature bearing on the transport and behavior of airborne material over certain types of complex terrain are reviewed. Cloud travel over shoreline complexes, islands and oceans or open water areas are considered. Data on observed cloud behavior and on observed downwind changes in vertical stability are used to calculate values for the vertical eddy diffusivities from which comparative values can be deduced for the vertical diffusion of airborne material resulting from trajectories involving some of these complex situations. For small-to-intermediate scale cloud travel, such factors as intitial vertical stability, travel time, air-water temperature differential, and shearing stratification aloft are found to be influential. For long travel distances, such additional factors as horizontal water temperature gradients and synoptic weather features become important. (Author)

AD-258 963 Div. 2, 1
(7 July 61) OTS price $1.10

4th Weather Group, Washington, D. C.
SYNOPSIS OF GEORGE'S TECHNIQUE FOR PREDICTING CLEAR AIR TURBULENCE (C.A.T.).
June 61, 8p. (4WG Pamphlet no. 105-9-1)
Unclassified report

DESCRIPTORS: Atmosphere, Turbulence, Wind, Aviation safety, Meteorological charts, Shear stresses, *Weather forecasting, *Gust loads, *Aircraft.

J. J. George successfully developed an easily used objective method for correlating both horizontal and vertical shear. Application to the heavily traveled air routes will promote flight safety and comfort; and specific application may be made to operational problems where turbulence is of special concern. The method is based primarily on obtaining numerical vertical shear values which equal or exceed a critical value, and correlating these values with horizontal shear in the area of very strong vertical shear. Vertical shear values can readily be obtained from winds aloft reports. Therefore, if these values could be arranged to make any sort of consistent pattern, then it should be possible to draw isolines of vertical shear. This idea was tested and found to be completely feasible. With practice, it will become easy and rapid to accomplish. (Author)

AD-258 972 Div. 2, 30
(3 July 61) OTS price $10.00

Round Hill Field Station, Mass. Inst. of Tech., South Dartmouth.
STUDIES OF THE SPECTRA OF THE VERTICAL FLUXES OF MOMENTUM, HEAT, AND MOISTURE IN THE ATMOSPHERIC BOUNDARY LAYER,
by Harrison E. Cramer, Frank A. Record and others. Annual rept. 15 Dec 59-15 Dec 60. Feb 61, 130p. incl. illus. tables.
(Contract DA 36-039-sc-80209)
Unclassified report

DESCRIPTORS: *Atmosphere, *Micrometeorology, Turbulence, Heat, Water vapor, Transducers, Anemometers, Thermistors, Hygrometers, Analog to digital converters, Instrumentation, Digital computers, Wind, Temperature, Boundary layer, Spectrographic data.

Investigation of the spectra of the vertical fluxes of momentum, heat and water vapor in the atmospheric boundary layer under various thermal stratifications and surface roughnesses was conducted. Four major phases of completed work are outlined: (1) design of instrumentation; (2) data-handling techniques; (3) data-analysis procedures; and (4) brief summary of initial field observations. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-258 504 Div. 3, 15
(23 June 61) OTS price $1.60

New York U. Coll. of Engineering, N. Y.
FIELD ASSESSMENT PROBLEMS,
by L. Herbach, B. Davidson and I. Pomper. Quarterly progress rept. no. 7, 1 Mar-30 May 61. 12 June 61, 18p. incl. illus. tables (Rept. no. 523.20)
(Contracts DA 18-108-cml-6392 and DA 18-108-405-cml-256)
Unclassified report

DESCRIPTORS: Micrometeorology, Dosage, Atmosphere, Diffusion, Integral transforms, Probability, Polynomials, *Chemical warfare agents, Numerical methods and procedures, Scattering, Munitions.

It is shown that the Calder-Salzer technique for computing munition expenditures probably implies that the moments of the dosage distribution do not exist. A simple modification of the Salzer inversion technique is being tried which does not require scaling. The diffusion model is simplified by introducing dimensionless parameters. This new procedure enables one to obtain a family of depositions as the result of a single integration. An outline of a new stochastic model of turbulent diffusion is given. (Author)

AD-258 576 Div. 3
(26 June 61) OTS price $4.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SIGNAL DISTRESS Mk 13 MOD 0,
by Lipman M. Singer. Airmunitions test rept. May 61, 44p. incl. illus. tables (OOY TR 61-20)
Unclassified report

DESCRIPTORS: *Distress signals, Tests, *Pyrotechnics, Smoke signals, Flares, *Signals, Design.

Three lots of Mk 13 Mod 0 smoke and illumination signals were subjected to physical tests because of an emergency unsatisfactory report from a using command. A total of 127 signals were subjected to visual inspection, leak tests, 24-hour water soak tests, tension tests, and hand function tests. The solder on the pull disk was quantitatively analyzed for tin, lead, and bismuth. This investigation revealed that the spot welds and pull rings of all lots did not meet specification requirements. Some signal cases were not water-tight. An excessive amount of glue was used to hold the paper caps to the signal. It was recommended that a design change be made to require 2 spot welds on the metal caps in lieu of one. It was also recommended that additional tests be included for the pull ring, the pull disk, the spot welds, and the water-tightness of the signal case. A quality level of 0.34% would be used in these tests. (Author)

AD-258 721 Div. 3
(29 June 61) OTS price $8.10

Ammunition Group, Picatinny Arsenal, Dover, N. J.
PRODUCE ENGINEERING OF GRENADE, SMOKE, SWP, T36E2,
by Kit Y. Wong and John J. Fagan. Technical rept. June 61, 1v. incl. illus. (Rept. no. DC-TR: 4-60)
(Proj. A6-46-57)
Unclassified report

DESCRIPTORS: *Smoke grenades, Pyrotechnics, *Smoke munitions, Smoke screens, Production, Tests, Design, Molding materials, Plastics, Manufacturing methods, Costs, Smokes, White phosphorus, Electric detonators, Detonators.

Extensive use of plastic-molded pieces, instead of intricately machined components, and repositioning the AC-6 Delay Detonator have realized considerable cost savings. Operations for the assembly and the sub-assemblies have been simplified and are more adaptable to mass assembly techniques. The failure of the propellant housing in the R&D design was eliminated by transferring the stress from the vent holes surface to the rugged threads of the propellant

body. Other significant design improvements made in this PE study were: painting the interior of the canister assembly and relocating the interior aperture for the loading of the propellant. The preliminary engineering tests of the T36E2 Smoke Grenade showed that the PE version is equal or superior in performance to the T36E1 Smoke Grenade. (Author)

AD-258 725 Div. 3
(10 July 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
DETERMINATION OF SENSITIVITY TO IMPACT OF PYROTECHNIC FLASH COMPOSITIONS USING MODIFIED PICATINNY ARSENAL IMPACT TEST,
by Joel Harris, David J. Edelman, and Seymour M. Kaye. June 61, 17p. incl. illus. tables (Technical notes no. FRL TN 20)
(Proj. TS5-5407)

Unclassified report

DESCRIPTORS: *Pyrotechnics, Calcium, Calcium compounds, Aluminum, Potassium compounds, Perchlorates, Fuels, Detonation, Impact shock, Sensitivity, Aging, Humidity, Temperature, Coatings, Test facilities, *Aluminized explosives.

Run-down impact sensitivity tests were conducted on FP-790 (30/20/50 Ca/Al/$KClO_4$), containing either elemental or $CaCO_3$-coated Ca and 60/40 $KClO_4$/Al. The effects of fuel particle size, aging of the composition after blending, exposure of the composition to 75% RH over various time intervals, and composition temperature were investigated. Flash compositions containing Ca as fuel were more impact sensitive than those containing atomized Al. The systems containing Ca also exhibited the most marked increase in impact sensitivity on heating to 110 C. No trend in impact sensitivity was apparent due to fuel particle size. Aging of the compositions in sealed containers for 1 mo resulted in a very slight increase in impact sensitivity, while exposure to 75% RH caused a marked decrease in impact sensitivity. The substitution of Ca-Al alloy for the individual fuel ingredients in FP 790 resulted in a slight increase in impact sensitivity. (Author)

4. CHEMISTRY

AD-258 457 Div. 4
(21 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE SYNTHESIS OF MONOALKYLCYCLOHEXANES OF THE COMPOSITION C15 - C18 WITH INCREASED DENSITY,
by Ye. B. Sokolova, G. V. Krasnova, and T. A. Zhuravleva. 15 Dec 60, 7p. incl. illus. (Trans. no. MCL-347 from Nauchnyye Doklady Vysshey Shkoly - Khimiya I Khimicheskaya Tekhnologiya 2:330-334, 1958).

Unclassified report

DESCRIPTORS: *Cyclohexanes, Alkyl radicals, Synthesis, Density, Benzenes, Chemical reactions, USSR, Hydrocarbons, Fuels.

Four new monoalkylsubstituted homologs of benzene have been synthesized and characterized according to their principal physicochemical properties. Their catalytic hydrogenation produced 4 new monoalkylsubstituted homologs of cyclohexane with 1 or 2 quaternary C atoms in the side chain: 2,4-dimethyl-4-cyclohexyloctane; 2,6-dimethyl-4-propyl-4-cyclohexylheptane; 2,2,4,6-tetramethyl-4-cyclohexylheptane; and 2,2,5-trimethyl-3-cyclohexylhexane. The density of the synthesized cyclanes ranged from 0.8392 to 0.8450 which considerably exceeds the density of monoalkylsubstituted homologs of cyclohexane of the same composition with a normal or weakly ramified side chain. As intermediate products of the synthesis, 5 tertiary alcohols were obtained for the first time: 2,6-dimethyl-4-propylheptadiene-1,6-ol-4; 2,6-dimethyl-4-propylheptanol-4; 2,5,5-trimethyl-4-phenylhexene-1-ol-4; 2,2,4,6-tetramethylheptene-6-ol-4; and 2,2,4,6-tetramethylheptanol-4. (Author)

AD-258 584 Div. 4
(26 June 61) OTS price $3.60

Sterling Chemistry Lab., Yale U., New Haven, Conn.
HIGH FIELD CONDUCTANCE RESEARCH. THE WIEN EFFECT AND IONIC ASSOCIATION,
by Andrew Patterson, Jr. and Harlow Freitag.
15 June 61, 11p. 16 refs. (Technical rept. no. 1)
(Contract Nonr-266700)

Unclassified report

DESCRIPTORS: Molecular association, Ions, *Electrical conductance, Electrolytes, *Electrochemistry, Solutions, Measurement, Programming, Digital computers, Electric fields.

The Onsager-Kim strong electrolyte theory of the Wien effect was programmed for machine computation and was combined with the Onsager weak electrolyte theory in such a way as to account for the high field conductances of associated electrolytes. The computation is a considerable improvement over previous ones, being both more precise and much faster. Graphs are presented of a number of computed results, compared with experimental measurements, illustrating the way in which theory and measurement can be combined to obtain information about ion association. (Author)

AD-258 585 Div. 4
(26 June 61) OTS price $1.60

Sterling Chemistry Lab., Yale U., New Haven, Conn.
HIGH FIELD CONDUCTANCE RESEARCH. THE WIEN EFFECT OF URANYL SALT SOLUTIONS,
by Andrew Patterson, Jr. and Joseph F. Spinnler.
20 June 61, 20p. 18 refs. (Technical rept. no. 2)
(Contract Nonr-266700)

Unclassified report

DESCRIPTORS: *Electrical conductance, *Electrochemistry, Molecular association, Ions, Measurement, Solutions, Electrolytes, Uranyl radicals, Nitrates, Perchlorates, Salts, Electric fields, Temperature, Hydrogen ion concentration.

Solutions of uranyl nitrate and perchlorate of the order of 0.0002 molar concentration exhibit a decrease in conductance upon the application of high electrical fields, in contrast with the usual behavior of electrolytes. The decrease in

conductance expressed as the high field conductance quotient, at 65 degrees amounted to 1.3% at a field of 200 kv/cm. The phenomenon was dependent upon temperature and pH. Both uranyl nitrate and perchlorate exhibited small positive Wien effects at 5 degrees, small negative Wien effects at 25 degrees with multiple crossover of the zero conductance quotient axis as a function of increasing fields, and a sizeable negative Wien effect at 65 degrees. The addition of acid decreased the magnitude of the negative Wien effect. (Author)

AD-258 587 Div. 4, 25
(27 June 61) OTS price $1.60

Politecnico di Milano (Italy).
RESEARCHES ON HYDROGEN OVERVOLTAGE ON METALLIC SINGLE CRYSTALS: NICKEL,
by L. Peraldo Bicelli and A. La Vecchia.
Rept. for Apr 59-May 60 on Surface and Interface Phenomena of Matter. Feb 61, 15p. incl. tables, 18 refs.
(Contract AF 61(052)144, Proj. 7022)
(WADD TN 60-270) Unclassified report

DESCRIPTORS: *Nickel, *Electrochemistry, Alkaline cells, Electrodes, Electrolytic cells, Wet cells, Perchloric acid, Hydrochloric acid, Sulfamic acids, Sodium compounds, Hydroxides, *Single crystals, *Metallic crystals, Hydrogen, Cathodes (Electrolytic cell), Italy.

Hydrogen overvoltage on nickel single crystal cathodes, oriented following the (100), (110) and (111) planes has been measured in perchloric acid, hydrochloric acid and in sulfamic acid solutions. The Tafel law holds nearly; the parameters being different for the different electrodes. (Author)

AD-258 692 Div. 4
(28 June 61) OTS price $1.10

Noyes Chemical Lab., U. of Illinois, Urbana.
(No title)
Final rept. by Raymond Longhi. 1960, 8p.
(Contract DA 11-022-ORD-2772)
(AROD rept. no. 2069:5) Unclassified report

DESCRIPTORS: *Nitrogen compounds, *Oxides, Chemical reactions, Thio radicals, Phenols, Butyl radicals, Sulfur compounds, Halides, Phosphines, Arsines, Antimony compounds, *Free radicals, Metallic compounds, *Complex ions, *Cyclohexenes.

REACTIONS OF NO WITH LEWIS BASES: 4-tert-Butyl thiophenol in aqueous NaOH reacted with NO to produce bis-(4-tert-butylphenyl) disulfide. Thiophenol reacted with NO in the presence of MeONa in MeOH to form a similar product. Triphenylphosphine in anhydrous diethyl ether reacted with NO to give a white solid, triphenylphosphine oxide, in 94% yield. When the reaction was repeated with triphenylarsine, no reaction was detected. Only the starting material was recovered when triphenylstibine was used. A white solid was produced when a diethyl ether solution of tetramethyl quanidine was saturated with NO for 16 hr at -78C. NITRIC OXIDE FREE RADICAL STUDIES: The system methanol-nitric oxide-diethyl amine-cyclohexene was subjected to a study of UV spectra. Positive results indicating reaction of NO with cyclohexene were not obtained. STUDIES ON REACTIONS OF THE ANION-(C2H5)2NN2O2(-): Studies were made of reactions of metal halides with (C2H5)2NH2(+) (C2H5)2NN3O2(-) and with Na (+) (C2H5)2NN2O2(-).

AD-258 695 Div. 4, 25
(28 June 61) OTS price $3.60

Minnesota U., Minneapolis.
ACID-BASE EQUILIBRIA IN ACETONITRILE. SPECTROPHOTOMETRIC AND CONDUCTOMETRIC DETERMINATION OF THE DISSOCIATION OF VARIOUS ACIDS,
by I. M. Kolthoff, S. Bruckenstein and M. K. Chantooni, Jr. Technical documentary rept. 1 May 61, 23p. incl. illus. tables, 24 refs.
(Contract AF 49(638)519)
(AFOSR-699) Unclassified report

DESCRIPTORS: *Chemical equilibrium, *Acids, *Dissociation, Acetonitriles, *Acid-base equilibrium, Determination, Conductivity, Spectrophotometers, Chemical indicators, Solutions, Hydrogen compounds, Bromides, Sulfuric acid, Nitric acid, Hydrochloric acid, Perchloric acid, Nitro radicals, Phenols, *Organic acids.

The indicators o-nitroaniline, o-nitro-p-chloroaniline, and o-nitrodiphenylamine are about 50,000 times as strong in acetonitrile as in water. Perchloric acid behaves as a strong acid; other acids denoted by HA are weak. Except in extremely dilute solutions HBr, H2SO4, HNO3, and HCl dissociate yielding reversibly H(+) and AHA(-). The over-all dissociation constants of these acids were determined spectrophotometrically with the aid of indicator bases and conductometrically for H2SO4 and picric acid. By other suitable methods the stability constants, (K sub AHA(-) equal (AHA(-)/(HA) (A (-)), were evaluated. The value of K sub AHA(-) decreases from 1300 for H2SO4 to 250 for HBr, and 200 for HNO3 and HCl at 25 C. The following values pK sub HA are reported: HBr, 5.5; H2SO4, 7.25; and HNO3 and HCl, 8.9. Picric acid at concentrations smaller than 0.1 M dissociates into H(+) and Pi(-), and pK sub HPi(--) equals 8.9. The ion pair dissociation constants of tetraethylammonium bisulfate and of lithium nitrate were found to be 0.0014 and 0.00041, respectively.

AD-258 697 Div. 4
(28 June 61) OTS price $1.60

National Bureau of Standards, Washington, D. C.
FLUOROCARBON POLYMERS,
by Leo A. Wall. May 61, 18p. incl. tables.
(Status rept. no. 13)
(Sponsored by Bureau of Naval Weapons)
Unclassified report

DESCRIPTORS: *Fluorocarbons, *Polymers, Synthesis, *Elastomers, Stability, Temperature, Molecular structure, Chemical bonds, Polymerization, Fluorides, Phenols, Chemical reactions, Vinyl radicals, Styrenes, Benzenes.

Efforts are being made to synthesize a polymer capable of extended usage as an elastomer in the temperature range of -65 to above 500 C. The chemistry of polyfluoroaromatics has reached a stage where the synthesis of many polytetrafluorophenylene-type polymers appears to be imminent. Many new vinylic-type polyfluorocarbons have been synthesized, but greater quantities of them are needed for polymerization and for studies of the polymer properties. It is planned to undertake the complete synthesis of aromatic fluorocarbons on a scale large enough to insure a rapid synthesis of the desired potential thermally stable molecular structures and to evaluate their important physical and chemical properties. (Author)

AD-258 760 Div. 4, 27
(29 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
A TECHNIQUE FOR CRYOPUMPING HYDROGEN,
by Jack Grobman. June 61, 28p. incl. illus. table (NASA Technical note D-863)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-863.

DESCRIPTORS: *Hydrogen, Pumps, Cryogenics, Diffusion pumps, *Vacuum pumps, Electric propulsion, Vacuum systems, Test equipment, Vacuum apparatus, Laboratory equipment, Design.

Experimental tests performed in vacuo indicated that a chemical adsorption reaction can be used to facilitate the cryopumping of H with liquid-N-cooled condensers. Cryopumping is accomplished by reacting H with O to form H2O, which will readily condense on a liquid-N-cooled surface. The reaction in vacuo was performed on a solid catalyst, which consisted of a bed of Pd-coated alumina pellets. Cryopumping was observed at pressures as low as about 0.4 micron of mercury. A laboratory cryopump consisting of 5.8 lb of catalyst and a liquid-N-cooled condenser achieved a pumping speed of about 570 l/sec at 1.0 micron of Hg. A laboratory model of a cryopump which could be used in an electric rocket test facility was studied. The experimental data obtained were used to estimate the size of the catalyst bed necessary to test a 50-kw electric thermal rocket with an H propellant flow rate of 0.00063 kg/sec (a pumping speed of 580,000 l/sec at an operating pressure of 10 microns of Hg.) (Author)

AD-258 774 Div. 4, 25
(29 June 61) OTS price $12.50

Rensselaer Polytechnic Inst., Troy, N. Y.
BIBLIOGRAPHY ON MOLTEN SALTS,
by George J. Janz. Second edition. Mar 61, 173p. (Technical rept. no. 2)
(Contract AF 49(638)978)
(AFOSR-786) Unclassified report

DESCRIPTORS: *Salts, Melting, *Bibliography, High temperature research, Electrochemistry, Electrolytic cells, Solutions, Thermodynamics, Thermochemistry.

A compilation is presented of references to published contributions in the area of molten salts from 1833 to 1960. The compilation is arranged first chronologically and then alphabetically by author. An author index is included with an indication of the page numbers on which the corresponding references are located.

AD-258 845 Div. 4
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATING THE CAPACITY OF WETTING A SOLID SURFACE WITH POLYMERS (Izucheniye Smachivayemosti Tverdoy Poverkhnosti Polimerami).
13 Apr 61, 8p. incl illus. (Trans. no. MCL-906 of Vysokomolekulyarnye Soyedineniya 1:1074-1076, 1959)
Unclassified report

DESCRIPTORS: *Solids, *Surfaces, *Wetting agents, *Polymers, Molecular structure, Hydrocarbons, Aluminum compounds, Hydroxides, Propenes, Butenes, Styrenes, Carbon black, Acrylic resins, Chromium catalysts, Theory, USSR.

The nature of reaction of low-molecular substances and polymers with a solid surface is highly varied. That difference lies in the fact that polymer wetting of a solid surface is connected with a change in the configuration of polymer chains, which requires additional energy consumption. That is why there can be no analogy in the orders of energy magnitudes concerning the wettability of solid surfaces with low-molecular hydrocarbons and polymers. The concepts of hydrophilic and hydrophobic nature are insufficient to evaluate the capacity of wetting solid surfaces with polymers. (Author)

5. COMMUNICATIONS

AD-258 375 Div. 5
(28 June 61) OTS price $5.60

General Cable Corp., New York.
CABLE, TELEPHONE WF-16( )/U,
by S. P. Lamberton and S. Rubinstein. Final rept. 30 May 58-28 Feb 61. 28 Feb 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-77996)
Unclassified report

DESCRIPTORS: *Telephone communication systems, *Telephone cables, *Field wire, *Field wire communication systems, Plastic coatings, Electric insulation, Design, Tests, Production, *Voice communication systems.

A new 4 wire (2 pair) voice frequency field telephone cable was developed and manufactured for field service test. The cable utilizes standard, commercially available materials and is fabricated with standard, commonly available, machinery. Each pair consists of 2 stranded conductors of copper alloy 85, #23 AWG approximately, insulated in parallel with high-density linear polyethylene with a figure 8 cross-section. This cross-section permits easy separation of the 2 conductors by tearing apart along the web which joins them. The nominal dimensions of a pair are: major axis 0.125 in, minor axis 0.083 in, conductor diameter 0.026 in, conductor separation 0.064 in. on center. The finished cable consists of 2 pairs twisted together with no over-all covering. The voice frequency transmission characteristics are essentially the same as Infantry Field Wire WD-1/TT with crosstalk better than 60 db per mile, the physical-mechanical properties of strength, toughness and storage life equal or exceed those of WD-1/TT. (Author)

AD-258 447 Div. 5
(23 June 61) OTS price $6.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
RADIO SET, TACTICAL, MAN-PACK (AN/PRC-38).
Final development rept. 13 Dec 58-30 June 60. 6 Jan 61, 63p. incl. illus. tables (Rept. no. RAD-SR-10-60-112)
(Contract NObsr-72714)
Unclassified report

Division 5 - COMMUNICATIONS

DESCRIPTORS: *Radio communication systems, *Walkie-talkies, Very high frequency, Radio ranges, Terrain, Electronic circuits, Speech transmission, Antennas, Power supplies, Design, Tests, *Transmitter receivers, *Voice communication systems, Telephone communication systems, *Radiotelephones.

Research efforts were directed to meet the tactical requirements of a portable tactical one-man radio set that is capable of communicating over a range of 15 mi in rolling terrain on a large number of channels in the VHF band. Two experimental models of AN/PRC-38 equipment were constructed and operated intermittently under both portable and mobile conditions. The feasibility of the concept and design approach of the VHF pack set was proven beyond any possible doubt. Areas of weakness are presented which must receive further attention. (Author)

AD-258 490 Div. 5, 12
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RADIO STATIONS OVER OUR PLANET,
by V. Chestnov. 7 Mar 61, 5p. incl. illus. (Trans. no. MCL-825 of Krasnaya Zvezda 220:pp. 4, Sep 60)
Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Satellite vehicles, *Radio communication systems, *Radio relay systems, Orbital flight paths, Reflection, Radio signals, Radio waves, Radio ranges, Extraterrestrial radio waves, Communication equipment, *Radio stations.

There is one field in which artificial earth satellites and space vehicles open huge prospects. This field is the increase of operational effectiveness and range of radio communications. Having taken into consideration the rapid development of rocket techniques and the increased load capacity of satellites, many specialists contemplate that communications systems with satellites can become in the near future even more economical than by other systems of distant communications. With the aid of communications satellites it will be possible to transmit telegrams, phototelegraphic images, radio broadcasting and even television transmissions simultaneously. (Author)

AD-258 527 Div. 5, 18
(27 June 61) OTS price $9.60

ITT Communication Systems, Inc., Paramus, N. J.
USAF 480L AIRCOM PROGRAM SYSTEM DESIGN. VOLUME III. TRANSMISSION SUBSYSTEM DESIGN.
8 June 61, 1v. incl. illus. tables (Rept. no. 1CS-61-TN-2)
(Contract AF 19(626)5)
(AFCCD TN 60-46) Unclassified report

DESCRIPTORS: *Air force communications, Data transmission systems, Communication systems, *Radio communication systems, Atmosphere, *Telephone communication systems, *Telegraph systems, Scattering, *Multiplex transmission, Mobile, Transmission lines, *Radio relay systems, High frequency, Very high frequency, Superhigh frequency, *Air force operations, Coaxial cables, Ultra high frequency, Very low frequency, Radio signals, *Communication equipment, Low frequency.

This volume evaluates and makes recommendations for utilization of both presently used and other available transmission subsystem equipment from the standpoint of 1961-1964 USAF 480L AIRCOM operational needs. To facilitate the work of the system designer in his fulfillment of specific communication requirements, this volume presents transmission subsystems as design modules. In categorizing and describing these modules, those transmission subsystems have been included that are now available or potentially available within the 1961-1964 AIRCOM time period. Potentially available subsystems are those that are capable of availability as subsystems of proven reliability and performance using techniques within the 1961-1964 state of the art. Proposed transmission subsystems currently in experimental stages that cannot be expected to be available as verified subsystems by 1964 have been excluded from the inventory under consideration. The major areas of utility for the various transmission subsystems are also presented. (Author)

AD-258 755 Div. 5, 25
(29 June 61) OTS price $1.60

Optical Communications Lab., Northwestern U., Evanston, Ill.
PULSE, MODULATION AND SCANNING TECHNIQUES (UV TO IR SPECTRAL REGION),
by W. R. Wilson. Quarterly rept. no. 2, 1 Sep-30 Nov 60, 30 Nov 60, 17p. incl. illus. table.
(Contract DA 36-039-sc-84930)
Unclassified report

DESCRIPTORS: *Optical systems, Infrared optical systems, *Pulse communication systems, Ultraviolet radiation, Infrared radiation, *Infrared communication systems, Sources, Modulation, *Light communication systems, Optical equipment, Attenuation, Vacuum systems, Simulation, Range, Design.

The design and construction of an optical attenuator unit is described suitable for simulating vacuum range. This unit was designed to assist in the evaluation of the effectiveness of optical communication equipment. In addition, suggestions for the proper use of the attenuator unit to avoid errors in measurement are included. (Author)

AD-258 835 Div. 5
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LIST OF SUBSCRIBERS - PART I - TELEPHONES OF ORGANIZATIONS, INSTITUTIONS AND BUSINESSES.
26 Apr 61, 30p. incl. tables (Trans. no. MCL-840 of Spisok Abonentov (Telefony Organizatsiy Ucherezhdeniy i Predpriyatiy) Part 1: pp. 1-20 and 23-24, 1958)
Unclassified report

DESCRIPTORS: Telephone communication systems, *Telephones, Directories.

AD-258 853 Div. 5, 12
(30 June 61) OTS price $1.60

Army Air Defense Board, Fort Bliss, Tex.
NIKE HERCULES INTER-AREA CARRIER COMMUNICATIONS SYSTEM.
Rept. of Check test. 24 May 61, 13p. (Proj. GM-760)
Unclassified report

DESCRIPTORS: Guided missile launchers, Communication systems, Intercommunication systems, *Radio communication systems, Tests, *Telephone communication systems, Frequency converters, Telephone cables, Voice communication systems, Surface to air.

Check tests were made to determine the suitability of the NIKE HERCULES Inter-area Carrier Communications System in both CONUS and field army application using: (1) Signal Converter, Telephone CV-417( )/GT; (2) Signal Converter, Telephone CV-418(.)/GT; (3) Telephone Line Transfer Control C-1981( )/TCC; and (4) Radio Set AN/GRC-66 (4.4 to 5 KMC Line-of-Sight), replacement for Radio Relay Set AN/TRC-24, in lieu of AN/GRC-104 which was proposed for this application. The inter-area carrier communications system will be suitable for both CONUS and field army application after a design change is instituted to prevent spurious signals from being received at the launching control trailer when the battery control area radio transmitter fails. The inter-area carrier communications equipment is particularly well suited for use with the mobile NIKE HERCULES battery. The maintenance package lacks the portion for Radio Frequency Multiplier, RF-131/G, but is otherwise adequate. (Author)

AD-258 911 Div. 5, 12
(3 July 61) OTS price $1.10

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS SPACE SYSTEMS.
Program progress rept. no. 49 for May 61. May 61, 4p.
(Contract AF 04(647)566)
Unclassified report

DESCRIPTORS: *Ground support equipment, *Communication equipment, *Communication systems, Installation, Maintenance, *Satellites.

AD-258 912 Div. 5, 12
(3 July 61) OTS price $5.60

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS. WEAPONS SYSTEM 107A-1.
Program progress rept. no. 49 for May 61. May 61, 1v. incl. illus.
(Contracts AF 04(647)123, AF 04(647)312, AF 04(647)461, AF 04(647)462, AF 04(647)486, AF 04(647)495, AF 04(647)502, AF 04(647)503, AF 04(647)608, AF 04(647)609, AF 04(647)738, AF 04(647)739, AF 04(647)740, AF 04(647)741, AF 04(647)747, and AF 04(647)811)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Satellite vehicles, *Ground support equipment, Surface to air, *Communication equipment, *Communication systems, *Quality control, Installation, Launching, Maintenance.

AD-258 913 Div. 5, 12
(3 July 61) OTS price $1.10

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPONS SYSTEM 107A-2.
Program progress rept. no. 49 for May 61. May 61, 3p. tables.
(Contract AF 04(647)298)
Unclassified report

DESCRIPTORS: *Guided missiles, Quality control, Surface to surface, *Ground support equipment, *Communication equipment, *Communication systems, Installation, Recording devices, Fire detectors, Amplifiers.

AD-258 920 Div. 5
(7 July 61) OTS price $8.10

ITT Federal Labs., Nutley, N. J.
RADIO SET AN/GRC-66. TROPOSPHERIC SCATTER MODIFICATION,
by J. R. Simkovich and A. S. Orlando. Quarterly rept. no. 3, 1 Dec 60-28 Feb 61. Apr 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-73086, Proj. 3-24-06-208)
Unclassified report

DESCRIPTORS: *Radio communication systems, Ultra high frequency, Superhigh frequency, Radio signals, Radio waves, Scattering, Atmosphere, Diversity systems, Pulse modulation, Coding, Frequency multipliers, Microwave amplifiers, *Multiplex transmission, Power supplies, Waveguide filters, Klystrons, Transistors, Power amplifiers.

Research concerns implementing the use of the line-of-sight AN/GRC-66 equipment for scatter operation in 2 frequency bands. Development was continued on the following new designs: (1) Parametric Amplifiers - 1.7 to 1.9 kmc unit, 4.4 to 5.0 kmc unit, and transistorized klystron power supply. (2) Combiner Applique - combiner, phase discriminator, AGC and phase lock alarm circuitry, and stable pullable local oscillator. (3) Doubler Unit - doubler section, and output filter. (4) Power Amplifier - universal 1.7 to 1.9 kmc and 4.4 to 5.0 kmc design, and semiconductor power supply, control and alarm circuitry. (5) Oscillator-Multiplier - extension of tuning range. (6) Receiver Mixer - design of 4.4 to 5.0 kmc unit interchangeable with existing 2 kmc unit. (7) Receiver Frequency Multiplier - design of varactor octupler. (Author)

AD-258 998 Div. 5, 8
(13 July 61) OTS price $8.60

Stanford Electronics Labs., Stanford U., Calif.
CHANNEL UTILIZATION BY INTERMITTENT TRANSMITTERS,
by F. F. Fulton, Jr. 12 May 61, 91p. incl. illus tables, 16 refs. (Technical rept. no. 2004-2).
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Radio transmitters, *Channel selectors, *Multiplex transmission, Coding, *Radio communication systems, Frequency dividers, Pulse modulation, Amplitude modulation, Mathematical analysis, Frequency modulation, Errors, Probability, Data transmission systems, Broadband.

The usual method of allocating spectrum space to various users does not take into account the extent to which the allocations are actually

utilized. If only a fraction of the transmitters are simultaneously active, calculation of the possible signaling rates, assuming mutually interfering operation, shows that better methods of spectrum utilization certainly exist if the fraction is small enough, and some systems can be implemented to retain a portion of this advantage while reducing the coding problem to manageable proportions. By studying the theoretical limit of channel utilization, however, it is shown that in fact better utilization is possible if the active fraction of the transmitters is merely less than one. The limit of channel utilization is studied by postulating a model of a band-limited, noisy channel that incorporates the feature of random selection of a subset of transmitters to be multiplexed within the bandwidth. It is shown by a random coding argument that sets of waveforms certainly exist that can provide operation without interference for any finite number of transmitters assigned to the channel, provided only that the total information transmitted by any subset of transmitters be appropriate for the signal powers involved. (Author)

6. DETECTION

AD-258 437 Div. 6, 8, 30
(26 June 61) OTS price $6.60

Armour Research Foundation, Chicago, Ill.
DIRECTORY OF ELECTRONIC EQUIPMENT CHARACTERISTICS. RADAR TYPES.
Quarterly progress rept. no. 2, 15 Dec 60-14 Mar 61. 14 Mar 61. 66p. incl. illus. (Rept. no. ARF 5147-Q2)
(Contract DA 36-039-sc-87176, Proj. 3B24-01-001-12)

Unclassified report

DESCRIPTORS: *Directories, *Radar equipment, *Radar interference, *Search radar, X band, Radar signals, Measurement, Polarization, Instrumentation, Test equipment, *Antenna radiation patterns, *Radar antennas, Recording systems, S band, Waveguides, Propagation, Test methods, Sensitivity, Radar tracking.

Research was continued on the compilation of a directory containing the characteristics of radar-type equipments, with particular emphasis placed on those characteristics which are pertinent to the interference problem. Plans were formulated for experimental tests to determine the response of the RF portion of the M-33 acquisition radar to signals propagated in different modes at various frequencies. Mode exciters for the TE10, TE01, TM11 modes and mode converters for the TE20, TE30, and TE02 modes were designed and constructed. Measurement procedures were checked out. A field pattern recorder system which will allow a 3 dimensional pattern to be taken using great circle cuts was completed. Provisions were made to vary the polarization of the auxiliary measurement antenna in synchronism with the polarization vector of the antenna under test. Patterns measured with respect to the desired and cross-polarized polarizations of a scaled model reflector at X-band frequencies were obtained. Specifications for an instrumentation van to contain measurement equipment for field tests of radars were formulated. (Author)

AD-258 473 Div. 6
(21 June 61) OTS price $7.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONSTRUCTION OF OPTICAL INSTRUMENTS, COLLECTION OF ARTICLES (SELECTED ARTICLES) (Opticheskoye Priborostroyeniye, Sbornik Statey).
8 Feb 61, 74p. incl. illus. tables (Trans. no. MCL-703 from Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti, Moscow, pp. 9-36, 125-151, 1959)

Unclassified report

DESCRIPTORS: *Optical instruments, Scientific reports, Design, *Gyroscopic sights, Aerial targets, Reliability, Mathematical analysis.

Contents:
Calculation and theoretical analysis of the procedure of working out the lead in optical gyroscopic sights, by L. P. Lazarev
Calculation of the parameters of the relative motion of an aerial target, taking into account the angle of attack of the fighter, by Ye. N. Lebedev

AD-258 482 Div. 6
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INTERFERENCE SPECTROMETER WITH AM SELECTION, by P. Connes. 21 Dec 60, 15p. (Trans. no. MCL-771 of Journal de Physique et le Radium 19:pp. 215-222)

Unclassified report

DESCRIPTORS: France, Technological intelligence, *Interferometers, *Infrared spectrophotometers, Spectrographic analysis, Infrared radiation, *Infrared spectroscopy, Amplitude modulation, Design.

A new spectrometric method, chiefly useful in the infrared is described. By replacing the mirrors of a Michelson interferometer with 2 gratings under equal incidence and by making the path difference between the 2 beams vary linearly, one is able to modulate in a complex spectrum a single element whose width is equal to the theoretical resolution limit of the grating. The solid angle of the admissible beam is much greater than a classical spectrometer, thus this method given an important increase in luminous flux. The first such instrument is described together with the first experimental results. (Author)

AD-258 543 Div. 6
(27 June 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
A SIDE-LOBE CANCELLATION SYSTEM, by Edwin Voznak and Edward Ramos. 31 May 61, 12p. incl. illus. (DOFL rept. no. TR-950)
(DOFL Proj. 24920)

Unclassified report

DESCRIPTORS: *Radar interference, Lobing, Reduction, Radar jamming, Countermeasures, Radar deception, Radar antennas, *Radar antijamming, Vulnerability, Radar equipment, Electronic circuits, Signal to noise ratio, Pulse analyzers, *Radar pulses, *Radar signals, Delay lines.

The vulnerability of a radar to interference can seriously reduce its effectiveness. Deceptive jammers, known as repeaters or spoofers, can enter the side lobes of the antennas as well as the main beam and obscure the target echo on the PPI. One method of reducing this interference is the cancellation of the side-lobe response by means of an auxiliary antenna channel. In this system, a fixed auxiliary antenna, having a beam width at least equal to the scan sector, feeds an auxiliary preamplifier so that the over-all gain difference between the main and auxiliary channels equals the side-lobe level of the main antenna. The return in the auxiliary preamplifier is delayed and fed through the main-channel amplifiers to preserve the relative system gain to the two returns. The amplitudes of the two returns at the amplifier output are compared and applied to coincidence and gating circuits so that the system accepts the main signal only when the return in the main channel is greater than the return in the auxiliary channel. (Author)

AD-258 569 Div. 6, 12
(26 June 61) OTS price $9.60

Motorola, Inc., Scottsdale, Ariz.
TRANSPONDER SET, AN/DPN-66(XCC-1),
by F. Kemmeries. Final engineering rept. Apr 61, 1v. incl. illus. tables (Rept. no. WF-2478-1)
(Contract AF 08(606)3775)
(AFMTC TR 61-12) Unclassified report

DESCRIPTORS: *Radar beacons, C band, *Radar tracking, *Guided missiles, *Satellite vehicles, *Guided missile tracking systems, Surface to surface, Radar pulses, Coding, Control systems, Ferrites, Magnetrons, Semiconductors, Modulators, Design, Tests, Reliability, Transmission lines, Radar equipment, Radar duplexers, Electronic circuits, Intermediate frequency amplifiers, Oscillartor circuits.

A resume of the developmental history of the AN/DPN-66 transponder developed for the Air Force Missile Test Center, Patrick Air Force Base, Florida is presented, together with the considerations leading to its evolution from a previous transponder, the AN/DPN-54. The AN/DPN-66 is a C-Band radar transponder used with precision tracking C-band instrumentation radars, such as the AN/FPS-16, for tracking long-rage missiles and satellites. This unit is an extremely compact, virtually all-transistorized, high performance pulse type radar beacon. Particular emphasis is placed on the discussions of the development and design considerations of those components of the transponder set which accounted for the major portion of the development effort. These are the ferrite circulator, the magnetron, the semiconductor modulator, and the qualification and acceptance tests performed on the AN/DPN-66 transponder. (Author)

AD-258 673 Div. 6
(28 June 61) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
ANALYSIS OF THE PUFFS TRACKER WOX-1A AS A GENERAL NONLINEAR FILTER,
by C. Nicholas Pryor. 6 Feb 61, 11p. illus.
(NAVWEPS rept. no. 7375) Unclassified report

DESCRIPTORS: *Sonar equipment, Statistical analysis, Tests, *Fire control systems, Automatic, *Tracking, Position finding, Equations, Targets, *Acoustic filters, Sonar targets, *Nonlinear systems, Sonar signals, Sonar, Theory, Analysis, Navigation, Radar.

Statistical analysis is made of the PUFFS Target Tracker WOX-1A. This device uses a nonlinear tracking scheme such that the estimated target position is changed in discrete steps of fixed magnitude, dependent only upon the sign of observed error at regular sampling intervals. The theoretical performance characteristics of the tracker are determined from the statistical analysis. Equations are developed for the output standard deviation of tracker position, the lag in tracker position due to bearing rates, and the equivalent integration time of the tracker as functions of the input standard deviation and the tracker step size. Experimental verification is presented for some of the results, and the qualitative operation of the tracker is discussed as an adaptive system interchanging bandwidth and output noise. Other applications for nonlinear systems of this type are mentioned, including tracking and post-filtering problems in sonar or radar, and filtering problems in navigation systems. (Author)

AD-258 710 Div. 6
(29 June 61) OTS price $10.10

Airborne Instruments Lab., Mineola, N. Y.
HANDBOOK OF OPERATING AND MAINTENANCE INSTRUCTION FOR INTERFERENCE BLANKER GROUP AN/GPX-27( ).
Apr 61, 1v. incl. illus. tables (Rept. no. 7318-H-1)
(Contract AF 30(635)14792)
Unclassified report

DESCRIPTORS: *Identification systems, Handbooks, Operation, Maintenance, Correlation techniques, Storage tubes, *Radar interference, Reduction, Coding, Sweep generators, Trigger circuits, Triggered gates, Video signals, Detectors, Installation, Radar equipment, *Instruction manuals, *Radar beacons.

Contents:
General description
Installation and adjustment
Operation
  Controls
Theory of operation
  Interference Blanker Drawer--Top Drawer
  Storage tube unit
  Amplifier-driver unit
  Sweep and gating unit
  High voltage power supply
  Power supply drawer
Maintenance
  Loss of system video output while in standby
  Loss of system video output while in defruit

7. ELECTRICAL EQUIPMENT

AD-258 413 Div. 7, 14, 25
(22 June 61) OTS price $1.10

General Ceramics Div., Indiana General Corp., Keasbey, N. J.
OXIDE THERMOELECTRIC MATERIALS.
Bi-monthly progress rept. no. 4, 2 Aug-1 Oct 60. 1 Oct 60, 6p.
(Contract NObs-78414)
Unclassified report

Division 7 - ELECTRICAL EQUIPMENT

DESCRIPTORS: *Thermoelectricity, *Oxides, Materials, Design, Resistance, Measurement, Titanium compounds, Zinc compounds, Iron compounds, Lithium compounds, Dioxides, *Semiconductors, Power supplies, Ceramic materials, Temperature.

Progress is reported on the work performed on the Seebeck coefficient and dc resistivity measurements for (Ti02)x(Zn0)100-x,(ZnFe204)100-x (Ti02)x, and (L120)x(Zn0)100-x compounds. The resistivity vs temperature behavior of the (Ti02)x(Zn0)100-x series of compounds is similar to that of the (A1203)x(Zn0)100-x series. A minimum of resistivity is evident at an intermediate temperature (about 1000 C). When L120 is added to Zn0 the number of conducting electrons in the material is reduced and the electrical conductivity is also reduced. With a nonstoichiometric, cation-deficient compound such as nickel oxide the roles of the additives are reversed. The members of the (ZnFe204)100-x (Ti02)x series are not suitable for use as current generators because of their relatively high resistances. (Author)

AD-258 424 Div. 7
(26 June 61) OTS price $8.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
ELECTRICAL CONTACTS IN SPACE ENVIRONMENT. AN ANNOTATED BIBLIOGRAPHY,
comp. by George E. Owens. May 61, 84p. 169 refs.
(Special bibliography no. SB-61-23; Rept. no. 3-77-61-1)

Unclassified report

DESCRIPTORS: *Bibliography, *Electrical equipment, Electric connectors, *Sliding contacts, *Space environmental conditions, *Electric switches, Ultraviolet radiation, Low temperature research, Radiation damage, Materials.

A bibliography is presented which is the result of a survey of recent literature pertaining to electrical contacts in a space environment. It supports a laboratory investigation into the effects of strong ultraviolet radiation, hard vacuum (10 to the -8th power mm Hg or less), and low temperature (-50 to +200F) upon moving electrical contacts operating at currents in the milliampere-microampere range and at contact potentials up to a few millivolts. The bibliography includes references to work antecedent to the laboratory investigation, even though such work may not have been carried out within the specified range of conditions. The 169 references are arranged alphabetically by personal authors in 3 categories: (1) books, (2) reports, and (3) journal articles. An index of secondary personal authors and corporate sources is provided, in addition to a subject index. (Author)

AD-258 618 Div. 7
(28 June 61) OTS price $14.50

Armour Research Foundation, Chicago, Ill.
LUNAR DRILL STUDY PROGRAM,
by A. V. Dundzila and J. A. Campbell. Final rept. 15 Aug-15 Dec 60. Jan 61, 1v. incl. illus. tables, 165 refs. (Rept. no. ARF 8208-6)
(Subcontract to Jet Propulsion Lab., Pasadena, Calif., Contract NASw-6)

Unclassified report

DESCRIPTORS: *Lunar probes, *Drills, Design, *Remote control systems, Test equipment, Effectiveness, Exploration, Geology, *Moon, Drilling machines, Selection.

An attempt was made to generate quantitative engineering information needed for technical definition of feasible devices to perform various types of remotely controlled drilling operations from a spacecraft placed on the moon. The study was intended to use existing applicable geological drilling performance data, with major efforts concentrated on problems posed by lunar environment, lunar vehicle capacity, and the very drill unit concept development. Unfortunately, the existing literature contributed negligible amounts of specific drilling data; thus, the project was reoriented into 2 major phases: experimental data gathering phase and lunar drill concept selection study. The experimental drilling phase contributed room environmental drill data for the parametric systems analysis and dimensional analysis and played a major part in the drill unit concept selection. A number of drill unit concepts and relating menchanisms were studied: the rotary-impact method was determined to be the most suitable for the lunar drill application. It is recommended that several of the areas studied be further investigated in the immediate future in order to give a more complete understanding of the problems involved.

AD-258 660 Div. 7, 14, 25
(28 June 61) OTS price $8.60

Hoffman Electronics Corp., Santa Barbara, Calif..
COATINGS FOR SOLAR CELLS,
by Robert M. Witucki and Arthur E. Lewis. Final rept. 15 Jan 60-28 Feb 61. 28 Feb 61, 86p incl. illus. tables, 14 refs.
(Subcontract to Jet Propulsion Lab., Calif. Inst. of Tech., Contract NASw-6)

Unclassified report

DESCRIPTORS: *Solar cells, *Coatings, *Infrared radiation, *Ultraviolet radiation, *Thin films, Silicones, Spectrophotometers, Reflectometers, Polymers, Absorption, Reflection, *Optical coatings, Blackbody radiation, Resins, Dielectrics, Infrared optical materials, Semiconductors, Materials.

The theoretical basis for the reflectance of dielectric materials in the ultraviolet and the near infrared was reviewed, as well as the properties required for high emissivity. It was concluded that single thin film coatings alone, of 1 micron or less in thickness, can not provide either adequate emissivity or high selective reflectivity of the wavelengths required and still show high transmission from 0.45 to 1.1 micron. A high emissivity was found to be the most important single method of rejecting energy in space. Therefore attention was directed primarily toward achieving maximum emissivity. Emissivities of the order of 0.9 can only be obtained using coatings of several mils thickness. Silicone coatings were found to be very simple and inexpensive to apply, and within the accuracy of available data to show a predicted performance in space equivalent to the presently used ultraviolet reflecting coated cover glasses. Numerous laboratory tests of limited time duration have shown the selected silicone coating to be stable to the expected environmental conditions during storage as well as in space. (Author)

AD-258 730 Div. 7, 25
(27 June 61) OTS price $6.60

General Electric Co., Syracuse, N. Y.
OPTIMIZATION OF THERMOELECTRIC ENERGY CONVERTERS,
ed. by Philipp H. Klein. Bimonthly progress rept. no. 3, 15 Aug-14 Oct 60. 14 Oct 60, 60p. incl. illus. table, 11 refs.
(Contract NObs-78403)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Generators, *Thermal conductivity, Encapsulation, Lead compounds, Tellurides, Materials, Hall effect, *Electric power production, Heat transfer, Thermal insulation, Chromium compounds, Antimonides, Magnesium compounds, Infrared spectroscopy, Tantalum, Calcium compounds, X-ray diffraction analysis, Silicates, Intermetallic compounds.

A detailed analysis of the first thermal system to be studied was completed. The system consists of saturated steam at 533 K (500 F) as the heat source, a thermoelectric converter of conventional configuration, and sea water at 291 K (65 F) as the heat sink. A forsterite encapsulating cell, to which iron end-caps were affixed by means of an iron-rich alloy of iron and titanium, was successfully operated at temperatures in excess of 1400 C. A method for encapsulating chromium antimonide, which expands on solidification, in standard iron-titanium-forsterite cells was perfected. Problems in the mixing of magnesium and antimony during the synthesis of Mg3Sb2 were overcome, as have those of its volatilization during the process. From infrared reflectance measurements on new specimens of CrSb, the substance appears to possess a band-gap energy of about 0.8 ev. Calcium silicide, calcium stannide, and calcium plumide were prepared in tantalum-lined iron pipes with steel end-caps. Welded capsules, made entirely of tantalum, were perfected. (Author)

AD-258 772 Div. 7, 4
(29 June 61) OTS price $1.10

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
REDOX FUEL CELLS,
by L. G. Austin. Quarterly progress rept. no. 5, 1 Mar-1 June 61. 1 June 61, 5p.
(Contract DA 49-186-502-ORD-917)
Unclassified report

DESCRIPTORS: *Fuel cells, Electric power production, Power supplies, Oxidation-reduction reactions, Reduction, *Titanium, Titanium compounds, *Tin, Dioxides, Ions, Hydrolysis, Sulfuric acid, Solutions, Electrochemistry, High temperature research, Temperature.

Investigations of the reduction of Ti(IV) to Ti (III) at temperatures in the region of 200 C have been hampered by the rapid hydrolysis, to give insoluble TiO2, of the Ti ions. Preliminary tests have shown that the stannous-stannic system is stable at these temperatures in 4N H2SO4. Reactivity tests will be made on this system. (Author)

AD-258 899 Div. 7
(3 July 61) OTS price $2.60

Electric Storage Battery Co., Raleigh, N. C.
INVESTIGATION OF AgO PRIMARY BATTERIES,
by G. M. Wylie. Quarterly progress rept. no. 7, 1 Jan-31 Mar 61 on Research and Development Work on a Non-Reserve AgO Primary Cell. 8 May 61, 21p. incl. illus. tables (Rept. no. E-11-61)
(Contract DA 36-039-sc-78319, Proj. 3G18-03-001)
Unclassified report

DESCRIPTORS: *Primary batteries, Wet cells, Electrolytic cells, *Silver compounds, *Oxides, Zinc, Potassium compounds, Hydroxides, Electrolytes, Electrodes, Tests, Storage, Battery separators, Zinc electrodes.

Experimental Zn/KOH/AgO sealed flat plate cells delivered 75 whr/lb and 6.25 whr/cu in. at the 5-hr rate to 84 whr/lb and 7 whr/cu in. at the 100-hr rate. Experimental unsealed cells retained 46 to 50% of their new capacity after 6 wk storage at 160 F. No improvement in cell performance was obtained at -30 F. (Author)

AD-258 907 Div. 7, 8
(3 July 61) OTS price $2.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, VARIABLE (FILM TYPE),
by Jerome G. Burns and Mark Steidlitz. Quarterly progress rept. no. 9, 1 June-31 Aug 60. 31 Aug 60, 18p.
(Contract DA 36-039-SC-75981)
Unclassified report

DESCRIPTORS: *Resistors, *Variable resistors, Films, Design.

Experiments with taper screening show that if the viscosity of the VZA is controlled, a screenable system can be made. Sandblasting, with Brady B-540 tape as a mask, has been specified for film removal. The equipment is available but not tested because of lack of substrates. Bulk cleaning of the elements in toluene has been found to be satisfactory. The impact extrusion dies for both the RV11 and RV12 housings have been completed, and gold anodizing has been selected as the protective finish. (Author)

AD-258 930 Div. 7, 26
(29 June 61) OTS price $12.00

Hartman Electrical Mfg. Co., Mansfield, Ohio.
LATCHING TYPE CONTACTOR 600 DEGREES F,
by L. R. Siegl. Rept. on Phase 5, Relays and Contactors, 3 Sep-3 Dec 60. 3 Dec 60, 1v. incl. illus. tables.
(Subcontract to North American Aviation, Inc., Los Angeles, Calif., Contract AF 33(600)35489)
Unclassified report

DESCRIPTORS: *Motor starters, *Manufacturing methods, Tests, Tools, Armatures, Production, Design, Instruction manuals.

This manual contains all data needed by a competent manufacturer to produce contactors identical to those previously built during this development program. Special emphasis is placed on describing the manufacturing processes and assembly procedures, as well as giving a close description of tests and adjustments. The bill of material is written in such a way as to indicate the assembly sequence forming a helpful addition to the assembly procedures. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-258 941 Div. 7
(3 July 61) OTS price $1.60

Oak Mfg. Co., Crystal Lake, Ill.
MINIATURE ROTARY PANEL SEALED SWITCH,
by Bernard Golbeck. Quarterly progress rept. no. 7, 1 Feb-31 Apr 61. 24 May 61, 16p.
(Contract DA 36-039-sc-81297)
Unclassified report

DESCRIPTORS: Electric switches, *Rotary switches, Switches, Rotary seals, Tests, Miniature electrical equipment, Sliding contacts, Dielectric properties, Design, Specifications.

Testing is reported of the endurance of index assemblies and complete switches. These and earlier tests indicate that the modified index assembly is satisfactory and probably could be made to meet the specifications. The stator, rotor and terminal portion of the switch is unsatisfactory and it is doubtful that this design could be made to pass the specifications. (Author)

AD-258 942 Div. 7
(3 July 61) OTS price $1.10

Oak Mfg. Co., Crystal Lake Ill.
MINIATURE ROTARY PANEL SEALED SWITCH,
by Bernard Golbeck. Quarterly progress rept. no. 6, 1 Nov 60-31 Jan 61. 6 Feb 61, 10p.
(Contract DA 36-039-sc-81297)
Unclassified report

DESCRIPTORS: Electric switches, *Rotary switches, Switches, Design, Materials, Sliding contacts, Tests, Miniature electrical equipment, Rotary seals, Specifications.

Testing of complete switches and various subassemblies is reported. Tests were conducted on various materials for the index springs and terminals to improve the operation of these components. A study was made of the basic design of the component parts in an attempt to evaluate the switch. The tests indicate that there are many inherrent limitations in the basic design of the switch. To correct these faults will require a considerable redesign of the components. These switches made in accordance with the original design are not suitable for presentation as preproduction samples as they will not meet the required specifications. (Author)

AD-259 039 Div. 7, 8
(3 July 61) OTS price $1.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, VARIABLE (FILM TYPE),
by Jerome G. Burns and John Woods. Quarterly progress rept. no. 10, 1 Sep-30 Nov 60. 30 Nov 60, 14p.
(Contract DA 36-039-sc-75981)
Unclassified report

DESCRIPTORS: *Resistors, *Variable resistors, Films, Design.

AD-259 040 Div. 7, 8
(3 July 61) OTS price $2.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, FIXED, NON-WIREWOUND (POWER TYPE),
by Dorothy M. Hoffman and William Leopold.
Quarterly progress rept. no. 10, 1 Aug-31 Oct 60. 31 Oct 60, 25p. incl. illus, tables.
(Contract DA 36-039-sc-75973)
Unclassified report

DESCRIPTORS: *Fixed resistors, Reliability, Tests, Production, Failure (Mechanics), *Resistors, Design, Metal films, Surfaces, Temperature, Ceramic materials.

An investigation into the failures in the RD37 and RD39 styles is presented. Substrate surface defects are described to be the major contributing cause of failure in life testing. The additional load-life testing of styles RD60, RD65, RD70 and RD35 has been completed. Preparations for full-scale pilot production of styles RD31, RD33 and RD35 were undertaken. Data for these styles and partial data for styles RD31, RD33, and RD35 are included. The manufacture of resistors for pre-production testing of style RD37 is complete. The manufacture of pre-production resistors for style RD39 is about 70% complete. The initial test data received for style RD37 is being analyzed because of the difficulties encountered with the ceramic substrates. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-258 405 Div. 8, 2
(26 June 61) OTS price $1.60

American Meteorological Society, Boston, Mass.
INVESTIGATION OF THE IRREGULAR STRUCTURE OF THE IONOSPHERE (Issledovanie Neodnorodnoi Struktury Ionosfery),
by V. D. Gusev, M. B. Vinogradova and others.
tr. by Roy Flagg. 8 Oct 60, 11p. incl. tables.
(Trans. no. T-R-332 of Moscow, Gosudarstvennyi Universitet, Vestnik 4:129-136, 1957)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: Ionosphere, Physical properties, Analysis, Radio waves, Wave transmission, Propagation, *Radio reception, *Ionospheric disturbances, High frequency.

AD-258 409 Div. 8, 2
(26 June 61) OTS price $1.10

American Meteorological Society, Boston, Mass.
THE CONNECTION BETWEEN SOLAR FLARES AND PHENOMENA IN THE LOWER IONOSPHERE (O Sviazi Mezhdu Solnechnymi Vspyshkami i Iavleniiami v Nizhnei Ionosfere),
by N. N. Eriushev and Iu. I. Neshpor, tr. by Charles E. Townsend. Nov 60, 11p. incl. tables.
(Trans, no. T-R-341 of Akademiia Nauk SSSR, Krymskaia Astrofizicheskaia Observatoriia, Izvestiia 20:12-21, 1958)
(Contract AF 19(604)6113)
Unclassified report

DESCRIPTORS: *Solar flares, *Atmospherics, Ionospheric disturbances, *Radio waves, USSR, Very low frequency, *Wave transmission, Intensity, Propagation, Ionization, Tables, Ionosphere.

A comparison is made between solar flares and the phenomena corresponding to them in atmospherics (f equals 37 kc) and minimum frequencies (fmin) of reflections from the ionosphere during vertical soundings. The results of the quantitative connection between them are given. The problems of the effectiveness of solar flares for the above-mentioned phenomena, depending on the position of the flares on the solar disk and on the time of day, are considered. (Author)

AD-258 411 Div. 8, 14
(23 June 61) OTS price $1.10

Clevite Corp., Cleveland, Ohio.
DEVELOPMENT AND EVALUATION OF A HIGH TEMPERATURE DIELECTRIC MATERIAL FOR CAPACITORS,
by John Koenig. Quarterly rept. no. 4, 1 July-30 Sep 60. 26 Oct 60, 9p. incl. tables.
(Contract NObs-78108)
Unclassified report

DESCRIPTORS: *Dielectrics, *Ceramic capacitors, Ceramic materials, Capacitors, Dielectric properties, Materials, Barium compounds, Lanthanum compounds, Zirconates, Oxides, Measurement, Tests, Electrical properties.

Life testing of ceramic disks of (Ba.97La.02)ZrO3, Ba.99(Zr.98Nb.02)O3 and La(Al.96Si.03)O3 at 350 C for 1000 hr was terminated. During this period a field of 60 v-dc/mil was applied continuously. Of these materials the (Ba.97La.02)ZrO3 disks stood the test successfully. The final values for individual disks were between 10 to the 9th power and 10 to the 11th power ohm-m for volume resistivity and between 2 and 90 megohm-microfarad for (RC)-products. The other materials failed by puncture, rupture or excessive drop of volume resistivity. The electrical properties of ceramics of (Ba.94La.04)ZrO3 and (Ba.91La.06)ZrO3 were determined from 250 to 500 C. The dielectric constants are about 38 at 250 C and diminish to about 36 at 500 C. The volume resistivity values are of the order of 10 to the 11th power at 250 C and 10 to the 7th power at 500 C. The dielectric quality factor at 250 degrees is nearly 2000 for (Ba.94La.04)ZrO3 and almost 1000 for (Ba.91La.06)ZrO3. The corresponding values at 500 C are close to 150 for both. (Author)

AD-258 421 Div. 8, 26
(22 June 61) OTS price $5.60

Radio Corp. of America, Somerville, N. J.
INDUSTRIAL PREPAREDNESS STUDY ON GERMANIUM ALLOY TRANSISTORS, DEVICE 1. (Volume I),
by J. Wright. Final rept. 26 June 56-18 Mar 60. 18 Mar 60, 49p. incl. illus. tables.
(Contract DA 36-039-sc-72709)
Unclassified report

DESCRIPTORS: *Transistors, Germanium alloys, Processing, Production, *Manufacturing methods, Tests, Design, Audiofrequency, Crystals, Seals, Life expectancy.

An Industrial Preparedness Study was made for the purpose of developing and establishing production designs for Device 1. Both versions of this device (NPN and PNP) are medium power, germanium alloy-type transistors designed for operation in the audiofrequency range. Effort was directed toward improving device quality, increasing production rates and yield. The major accomplishments were: (1) standardization of parts and jigs for both devices wherever possible, (2) improved etching techniques, (3) improved alloying techniques, (4) improved mounting techniques, and (5) obtained satisfactory high temperature storage life. Processing was improved and equipment, jig and fixture designs were modified to improve both the quality of product and the production rate. (Author)

AD-258 427 Div. 8
(26 June 61) OTS price $7.60

Chalmers U. of Tech. (Sweden).
THE DOPPLER EFFECT IN DISPERSIVE, INHOMOGENEOUS MEDIA WITH APPLICATIONS TO ELECTROMAGNETIC WAVES IN IONIZED MEDIA,
by O. E. H. Rydbeck. Mar 60, 68p. incl. illus. 77 refs. (Research rept. no. 10)
(Contract AF 61(052)159)
(AFCRL-169)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, Doppler systems, *Wave transmission, *Ionosphere, *Wave analysis, Mathematical analysis, Refractive properties, *Refraction, *Ionospheric propagation, Propagation, Focusing.

This study concerns the Doppler effect and its application to dispersive, anisotropic and inhomogeneous media. The isotropic ionosphere was chosen for research as a primary characteristic

example of a resonant medium, even though mechanical sources, like satellites, can not attain the velocities required for irregular modes to appear with any strength in such a simple medium. It is shown, that the Doppler modes may become focused or defocused, depending upon the special conditions prevailing. The focusing effect is also described graphically. This representation yields immediate information regarding the possible presence of irregular ''Doppler modes'' The complex Doppler effect is studied by means of geometrical optics. This serves as an introduction to the full wave treatment, which in its turn yields the true field intensities and the focusing effects. The geometrical methods were also extended to the more complicated case of the magneto ionic medium. (Author)

AD-258 440 Div. 8, 26
(22 June 61) OTS price $18.50

Radio Corp. of America, Somerville, N. J.
INDUSTRIAL PREPAREDNESS STUDY ON GERMANIUM ALLOY TRANSISTORS, DEVICE 1. (VOLUME II), by J. Wright and U. Roundtree. Final rept., Vol. 2, 26 June 56-18 Mar 60. 18 Mar 60, 1v. incl. illus. tables
(Contract DA 36-039-sc-72709)
Unclassified report

DESCRIPTORS: *Transistors, Germanium alloys, *Manufacturing methods, Materials, Design, Specifications, Military requirements, *Processing, Single crystals, Test equipment, Tests, Tools, Production, Crystals.

Research is reported in 2 Volumes. Volume I (AD-258 421) contains the purpose, abstract, introduction, narrative, information on personnel, and the engineering time summary. This Volume contains final process specifications and supporting information such as flow charts, drawings, photographs, military specifications, and equipment and materials. (Author)

AD-258 441 Div. 8, 26
(22 June 61) OTS price $19.75

Sylvania Electric Products, Inc., Emporium, Pa.
(No title). Final technical rept. 29 Apr 58-31 Dec 59,
by Gordon H. Klinestiver, Jr. 31 Dec 59, 1v. incl. illus. tables.
(Contract NObs-8038)
Unclassified report

DESCRIPTORS: Electron tubes, *Triodes, Ceramic materials, Design, Manufacturing methods, Processing, Seals, Vacuum seals, Metal seals, Production, Materials.

Pilot line production work on ceramic envelope, Type SN-2358C, was preceded by a design evaluation of the identical structure sealed in a glass envelope. Ceramic to metal active alloy sealing was investigated because of the apparently inherent ability of the NiTi seal to form microscopic cracks; a workable solution was obtained. Exhaust and processing techniques were improved by design of a resistance heating system capable of processing and sealing several tubes simultaneously. Environmental testing and evaluation of Type SN-2358C indicated that the design is capable of surviving 400 C temperatures for extended periods. Improvements in structure resulted in a tube which was approaching 100% yield after 750G shock tests. Sweep frequency vibration fatigue tests resulted in early failure of the tubes in most cases. Evaluation of Type SN-2358C in a severe dc amplifier application indicated that the tube should compete with many existing premium glass triodes. (Author)

AD-258 444 Div. 8, 25
(23 June 61) OTS price $1.60

Bell Telephone Labs., Whippany, N. J.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 3, 1 Jan-31 Mar 61. 22 May 61, 20p. incl. illus. (Rept. no. 25334-B)
(Contract DA 36-039-sc-85364)
Unclassified report

DESCRIPTORS: *Quartz crystals, Growth, *Quartz resonators, Internal friction, Physical properties, Electrolysis, Diffusion, Acoustics, Temperature, Radiation damage, Absorption, Crystals.

Measurement of acoustic absorption continued at elevated as well as at low temperatures. It has been established that contact metal electrodes used in electrolyzing quartz yield incompletely treated material and that in this respect vapor-plated gold electrodes are superior. The turnover point (temperature where $df/dt = 0$, for a curve of frequency vs temperature) has been studied as a function of angle of rotation from the Y-axis. A resonator cut at theta equal to +53 degrees from the Y-axis has a turnover point at 535 C. This has facilitated the measurement of acoustic absorption at elevated temperatures. From preliminary results on these high-angle crystals, it appears feasible to fabricate a high-temperature resonator operating at its turnover point. One specimen of electrolyzed synthetic quartz operating at 5 mc has yielded a value of Q in excess of 600,000 at 500 C. (Author)

AD-258 445 Div. 8
(26 June 61) OTS price $2.60

Bell Telephone Labs., Inc., North Andover, Mass.
QUARTZ CRYSTAL CONTROLLED OSCILLATORS, by W. L. Smith and W. J. Spencer. Interim rept. no. 2, 1 Jan-31 Mar 61, 10 Apr 61, 24p. incl. illus. (Rept. no. 25335-A)
(Contract DA 36-039-sc-85373)
Unclassified report

DESCRIPTORS: *Quartz crystals, *Crystal oscillators, Oscillators, *Frequency stabilizers, Guided missiles, Stability, Satellite vehicles, Circuits, *Crystal ovens, *Oscillator circuits, Crystals, Vibration, Acceleration, Temperature, Aging, Design, Crystal holders, Test, Measurement.

Continued testing of 5-mc 5th overtone ruggedized crystal units indicated that the frequency of these units will remain constant to + or -2 pp 10 to the 9th power during both vibration and acceleration. Some aging data on metal-enclosed units as well as glass units containing getters is presented. A description of precision transistor oscillators used for aging is given, and results obtained which indicate that the two-stage ovens used with these oscillators reduced temperature deviations, as seen by the crystal unit, to less than + or -2 x 0.0001 degrees C for periods up to 60 hours. (Author)

AD-258 454 Div. 8
(21 June 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTROSTATICS AND ELECTRONICS. THE ELECTRONIC CONTROL OF ELECTROSTATIC GENERATORS (Electrostatique Et Electronique. La Regulation Electronique Des Generateurs Electrostatiques),
by N. Felici. Mar 60, 66p. incl. illus. (Trans. no. MCL-268 from L'onde Electrique 37:7-27, Jan 57)
Unclassified report

DESCRIPTORS: France, Technological intelligence, *Electrostatic generators, *Electrostatics, Power supplies, *Electronic circuits, Generators, Stabilization, Mathematical analysis, Amplifiers, Electronic equipment, Control, *Electronics, Analysis.

To assert that electronics is applicable to the control of electrostatic generators is to announce a self-evident fact. What is not so, is the exceptional simplicity and efficiency of the systems which combine an electronic amplifier and an electrostatic generator, due to the relationship between these two types of apparatuses. A mutual inductance which is practically zero, for a conventional generator and a stability of 0.0001 for a stable generator can be achieved without an electrostatic generator. What must be examined is the more or less great complexity of the solutions, because it is this complexity which, in the end, determines the cost and also the safety. The turning electrostatic generator has, like the condenser, its place among the various electronic parts. In contrast to the electromagnetic converters, which cannot be easily associated with low-power tubes, the electrostatic machines are integrated without difficulty with electronic systems. (Author)

AD-258 481 Div. 8, 25
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEMS AND TECHNIQUES IN EXPERIMENTS (SELECTED ARTICLES).
23 Feb 61, 13p. incl. illus. (Trans. no. MCL-757 of Pribory i Tekhnika Eksperimenta 2:pp. 146-148 and 150-152, 1960)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Ion accelerators, *Ionic current, Measurement, Tests, Test equipment, Test methods, Plasma physics, Optical systems, Ion sources, Ion beams, Electron tubes.

Shortcomings in measuring large currents (milliamperes in multiples of ten) in ion-accelerating tubes are presented. Results of electrical measurements are compared with measurements made by the heat method. The structure of a simple and reliable operating 50-kv ion-accelerating tube having an ionic current up to 20 ma is described. (Author)

AD-258 488 Div. 8
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
COMPENSATION OF AN ELECTRONIC VOLUMETRIC CHARGE BY ALKALI METAL IONS (Kompensatsiya Elektronnogo Obyemnogo Zaryada Ionami Luzhnikh Metaliv),
by M. E. Gurtoviyl and N. M. Livshits. 1 Mar 61, 15p. incl. illus. (Trans. no. MCL-822 of Fizchniy Zbirnik 9:pp. 93-100, 1956).
Unclassified report

DESCRIPTORS: *Alkali metals, Gas discharges, *Electron tubes, Ions, Theory, Cesium, Cathodes (Electron tubes), Anodes, *Glow discharges, Electronic circuits, Electron beams, Potassium , Metallic smoke deposits, Vapors, Sodium.

A comparative investigation was made of the compensibility of ions of different alkali metals namely; cesium, potassium and sodium. It was found that the compensibility of cesium ions in any case does not exceed the compensibility of potassium ions. This gives proof about the peculiar mechanism of compensation in conditions when electrons and ions originate on one and the very same surface. Assumptions are made regarding the mechanism of compensation in these conditions. (Author)

AD-258 499 Div. 8, 5
(23 June 61) OTS price $2.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
INVESTIGATIONS OF THE MEASUREMENT OF RADIO INTERFERENCE,
by Fred Haber and Kamal Ya'Coub. Progress rept. no. 58, 1 July-30 Sep 60. 15 Oct 60, 16p. incl. illus. (Rept. no. 61-06)
(Contract NObsr-72505)
Unclassified report

DESCRIPTORS: *Radio interference, Measurement, Electrical corona, *Underwater communication systems, *Communication systems, Meters, Standardization, Mathematical analysis, *Radio communication systems.

Contents:
Corona noise studies
RIFI meter response to low repetition rate impulses
Standard measurement of interference fields
Equipment evaluation
Effects of noise on underwater communications
Standardization of measurement of interference fields
Review of problems connected with ground current method
Gain of a collection of radiators

AD-258 503 Div. 8
(23 June 61) OTS price $1.60

Sylvania Electric Products, Inc., Emporium, Pa.
(No title). Quarterly interim engineering rept. no. 2, 1 Oct-31 Dec 60,
by Robert J. Bisso. 31 Dec 60, 6p. incl. illus.
(Contract NObsr-81552)
Unclassified report

DESCRIPTORS: Electron tubes, *Miniature electron tubes, *Subminiature electron tubes, *Cathode followers, Design, Tests, Life expectancy.

Investigations were continued in the development of miniature and subminiature tubes with very high transconductance and interelement capacitances suitable for cathode follower application at video frequencies. Work on miniature cathode

follower, type SN-2967, was devoted to: (1) investigation of static characteristics for tests with amplification factors of 40 and 50, (2) further evaluation of test F6366, (3) initiation of additional tests to obtain tubes for performance and environmental stress testing, and (4) determination of life test conditions for stable operation at 10 watts plate dissipation. Work on subminiature cathode follower type SN-2968, progressed satisfactorily. The first tubes were exhausted, processed and the static characteristics were found to be close to the objective specifications. (Author)

AD-258 508 Div. 8
(3 July 61) OTS price $6.60

New York U. Coll. of Engineering, N. Y.
STUDY OF SHORT TERM STABILITY OF CRYSTAL OSCILLATORS,
by James Rarity, Lester Saporta and Gerald Weiss. Quarterly rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 66p. incl. illus. (Rept. no. 3)
(Contract DA 36-039-sc-85376)
Unclassified report

DESCRIPTORS: *Crystal oscillators, Errors, Oscillators, Stability, *Frequency stabilizers, *Frequency analyzers, Frequency multipliers, Test equipment, Measurement, Low pass filters, Mathematical analysis, Phase measurement, Reduction.

Research was continued on phenomena producing short term frequency variations in high precision crystal oscillators. A set of design curves are presented which facilitate the selection of the operating parameters of the multiplier-heterodyne frequency measuring system. A discussion is given of the improvement in measurement uncertainty afforded by utilizing a filter to reduce the random effects introduced by a non-ideal multiplier. The effects of random noise added to a sine wave on the mean value and variance of the zero crossing are also discussed. (Author)

AD-258 517 Div. 8
(22 June 61) OTS price $3.60

Radio Corp. of America, Harrison, N. J.
THE DESIGN AND DEVELOPMENT OF A ONE-HALF WATT HEATER POWER REDUCED SIZE NUVISTOR TRIODE,
by W. J. Helwig. Interim development rept. no. 2, 1 Oct-31 Dec 60. 31 Dec 60, 27p. incl. illus.
(Contract NObsr-81478)
Unclassified report

DESCRIPTORS: *Triodes, Electron tubes, Electron tube heaters, *Radiofrequency amplifiers, *Miniature electron tubes, Design, Tests, Life expectancy, Ceramic materials, *Microwave amplifiers.

Samples of the initial model of the developmental A15200 triode were successfully made and meet the requirement of less than one-half watt heater power input. Dynamic characteristics are considered to be good, but work was begun on design refinements which are expected to achieve still further improved performance. Preliminary life tests indicated no basic problems with the design. Preliminary operational tests as a 450 mc RF amplifier were encouraging. (Author)

AD-258 528 Div. 8
(27 June 61) OTS price $9.10

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
PROPERTIES AND REALIZATION OF CERTAIN VARIABLE NETWORKS,
by N. Herbst. 30 Jan 61, 99p. incl. illus. table, 13 refs. (Research rept. no. EE 486; Technical rept. no. 61)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: *Electrical networks, Theory, Semiconductors, Capacitors, Functions, Circuits, Impedance.

A survey of available physical network elements reveals that an extension of network theory to include variable elements is practical. Semiconductor variable capacitors seem especially practical. Several connections of these capacitors are analyzed, and the series back-to-back is shown to be best with respect to eliminating signal effects upon the capacitance. Single-element-kind networks are considered in detail. Necessary and sufficient relizability conditions upon the driving-point impedances of lossless networks with one variable element are then derived and a realization procedure developed. The realization for lossless networks is extended to include networks with one variable reactive element and one resistance. A set of necessary and sufficient conditions for the realizability of driving-point impedances of these networks is developed and a realization procedure is presented, which leads to a set of canonic forms for such networks. The technique is also adapted to allow realization of certain variable transfer functions. (Author)

AD-258 538 Div. 8, 25
(27 June 61) OTS price $8.60

Columbia Radiation Lab., New York.
ENHANCED HARMONIC GENERATION IN MAGNETRONS,
by Walter Strauss. Doctor's thesis. Special technical rept. 1 June 61, 87p. incl. illus. tables.
(Contract DA 36-039-sc-78330)
Unclassified report

DESCRIPTORS: *Magnetrons, Range, Electromagnetic waves, Harmonic oscillators, X-band, Electron tubes, Microwave frequency, Microwaves, Space charges, Radiofrequency spectrum analyzers, *Radiofrequency generators, Electromagnetic fields, Tuning devices, Waveguides, Magnetic fields, Anodes (Electron tubes), Phase shifters, Microwave equipment.

AD-258 539 Div. 8
(27 June 61) OTS price $.75

Electronics Research Lab., U. of Calif., Berkeley.
THE POWER FLOW IN ELECTRON BEAMS AS SEEN BY A MOVING OBSERVER,
by Rudolf Muller. Rept. on Research on Physical Phenomena Affecting the Characteristics of Electronic Components, Dec 60, 22p. incl. illus.
(Contract AF 33(616)6139, Proj. 4150)
(WADD TR 60-853) Unclassified report

DESCRIPTORS: *Electron beams, Electrons, Propagation, Transformations, Amplifiers, Phase transitions, *Space charges, Microwave amplifiers, Phase modulation, Mathematical analysis, Plasma physics, Electromagnetic theory.

It is helpful for the understanding of the mechanism of a wave propagation in an electron beam with constant drift velocity to consider the propagation from the standpoint of an observer moving with the average velocity of the electrons. The power flow in an electron beam as seen by a moving observer depends upon the relative velocity between the electron and the observer. The dc kinetic power flow goes to zero as the observer approaches the velocity of the electrons. The ac power flow (the sum of ac kinetic and electromagnetic power flow) depends upon the relative motion of the observer to the electrons and upon the ratio of the observer's velocity to the phase velocity of the wave propagation. It is shown that the ac power flow changes sign at points where the observer travels synchronously with the phase of the wave. (Author)

AD-258 579 Div. 8
(27 June 61) OTS price $3.60

Ohio State U. Research Foundation, Columbus.
SOLID-STATE LOGICAL TRANSDUCERS,
by F. E. Battocletti, A. C. Thomas and others. Feb 61, 35p. incl. illus. tables, 16 refs.
(Contract AF 33(616)6416; continuation of Contract AF 33(616)5923, Proj. 9-(8-4150))
(WADD TR 60-774) Unclassified report

DESCRIPTORS: *Electronic circuits, *Electronic switches, *Transducers, *Switching circuits, Algebra, Mathematical analysis, Mathematical logic, Transistors, Vector analysis, *Diodes, *Triodes, Negative resistance circuits, Waveform generators, Classification, Semiconductors, Solid state physics, Theory.

One central problem in switching function theory is the classification of all binary switching functions of a given number of input variables into equivalence classes by rearrangement and negation of the input variables. Several theorems describing properties of the switching functions which result in various types of symmetries of the functions under input rearrangement and negation are presented. The analysis is based on the representation of the switching function in terms of set of vectors from a finite dimensional vector space over the field of integers modulo 2. This approach makes use of the properties of the groups of transformations on the vector space which are related to the input rearrangements and negations. One type of solid-state logic unit investigated was the field-effect transistor with 2 control gates located concentrically around the source terminal. Another approach to the problem of realizing multiple input logic functions is to employ 4-layer diodes coupled internally in a single piece of semiconductor. A number of 4-layer diodes were fabricated and tested with external coupling. (Author)

AD-258 586 Div. 8
(27 June 61) OTS price $2.60

Radio Corp. of America, Lancaster, Pa.
CONSTRUCTION OF A 25 WATT CERAMIC BEAM POWER TETRODE,
by F. W. Peterson and A. W. Bachman. Quarterly progress rept. no. 5, 16 June-15 Sep 60. 22 Dec 60, 21p. (Rept. no. 6)
(Contract DA 36-039-sc-78032)
Unclassified report

DESCRIPTORS: *Tetrodes, Electron tubes, *Beam power tubes, Ceramic materials, Radio communication systems, *Communication equipment, Very high frequency, Design, Tests, Manufacturing methods, Production.

Design programs were initiated in an effort to reduce the present required heater power for the A-2582A tetrode. The 2.5 g, 25 cps vibration test was successfully completed on 3 tubes. Variable frequency vibration testing was also successfully completed on 3 tubes. The second of the three tubes was placed on 76 mc amplifier life test. Evaluation of recent tubes revealed that tube ratings on input power and dissipation were very conservative. New ratings were adopted. A total of 22 A-2582A tubes were successfully fabricated and exhaust-processed. (Author)

AD-258 589 Div. 8, 26
(27 June 61) OTS price $5.60

RCA Industrial Tube Products, Lancaster, Pa.
PRODUCTION ENGINEERING MEASURE TUBE TYPE A2582A,
by Ben Sheren. Quarterly rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 50p. incl. illus. tables.
(Contract DA 36-039-sc-85947)
Unclassified report

DESCRIPTORS: *Tetrodes, *Beam power tubes, *Electron tubes, *Manufacturing methods, Production, Processing, Design, Test equipment, Industrial mobilization.

Investigations are concerned with establishing manufacturing facilities to produce a minimum of 100 tubes per month of type A-2582A, and improving producibility of both the type A-2582A and type 6884 tubes by advanced production techniques. Cathode-grid electrode spacing obtained by the Lucite spray technique was used favorably. Approximately one third of the necessary pilot line equipment, jigs and fixtures were constructed. Life test equipment was fabricated and assembled. An economic evaluation is in progress to select a furnace design for high production brazing. Progress on the various methods of combining heaters and ceramics is reported. Voltage and waveform observations were retaken on two electrical discharge machines as part of the long range study schedule. A holding fixture was designed and built, solving the problem of light transmission when grinding a broach in a projection grinder. Operator training was started, and several of the basic assemblies were produced.

AD-258 592 Div. 8
(27 June 61) OTS price $5.60

Sperry Gyroscope Co., Great Neck, N. Y.
SLOW-WAVE INTERACTION STRUCTURES FOR HIGH-POWER TRAVELING-WAVE TUBES,
by C. C. Wang, I. Itzkan and others. Final engineering rept. 30 June 59-30 Oct 60. Apr 61, 31p. incl. illus. tables, 14 refs. (Rept. no. NA-8210-8246)
(Contract NObsr-77590)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, S band, Transmission lines, Electronic circuits, Mathematical analysis, Test methods, Tests, Test equipment, Electric fields, Theory, Impedance, Radiofrequency power, Measurement.

The program to determine a slow-wave interaction structure for high-power traveling-wave tubes resulted in the development of a circuit termed the ring-loaded meander line. This circuit, demonstrating freedom from interfering modes, high interaction impedance, 70% bandwidth, and better than 1-megawatt power-handling capability at S band, can lead to an entire array of traveling-wave tubes. A theoretical analysis of the ring-loaded transmission line, a generic ancestor of the meander line, was performed to seek solutions to the determinantal equation f(k, beta) = 0. By introducing a meander factor, the results were applied to the meander line circuits. Extensive cold testing was performed by varying the geometric parameters and observing the effects upon dispersion, impedance, and frequency characteristics. A hot-test structure, a tube to demonstrate the meander line at peak power and full bandwidth, was designed and partially assembled. (Author)

AD-258 598 Div. 8, 7, 14
(27 June 61) OTS price $1.60

Westinghouse Electric Corp., Baltimore, Md.
ELECTROLUMINESCENT FERROELECTRIC (ELF) SOLID STATE DISPLAY,
Quarterly interim development rept. no. 12, 1 Mar-31 May 61. 31 May 61, 10p. incl. illus. tables.
(Contract NObsr-72782)

Unclassified report

DESCRIPTORS: *Display systems, Solid state physics, *Luminescent materials, *Ferroelectric materials, Thin films, Phosphors, Brightness, Ceramic materials, Fluorescent screens, Materials, Electronic switches, Manufacturing methods, Lighting systems, Design, Tests.

Investigations were continued on the design and development of a solid state display panel consisting of a multitude of small individual cell structures. Brightness and current were measured for several specimens of ZnS:Cu; Cl films at temperatures of 77 K to 330 K. Measurements on all the new ceramic material received to date were completed, utilizing both standard and fringing electrodes. (Author)

AD-258 620 Div. 8
(28 June 61) OTS price $1.10

Radio Corp. of America, Lancaster, Pa.
IMAGE INTENSIFIER ISOCON FEASIBILITY STUDY,
by R. E. Hoffman. Interim engineering rept. 1 Dec 60-31 May 61. 29 May 61, 3p. illus.
(Contract AF 33(616)7696)

Unclassified report

DESCRIPTORS: Electron tubes, *Image tubes, *Image intensifiers (Electronics), Electron guns, Targets, Thin films, *Video signals, Production, Magnesium compounds, Design, Aluminum compounds, Focusing, Oxides.

Research is concerned with determining the feasibility of an image intensifier isocon. The isocon gun will have a large-diameter, axially-aligned separation electrode using a 4 plate steering assembly. The intensifier section will be the electrostatically focused section presently used on the C73477 and C74036. If a magnetically focused intensifier section becomes available, it will be incorporated into the design. Thin film magnesium oxide and aluminum oxide targets were evaluated. Equipment to test image isocons and image intensifier isocons was provided by modifying existing test equipment with the addition of necessary voltage supplies for operation of the isocon gun. A phase inverting amplifier was also added to present the isocon picture with the proper polarity. Efforts were directed toward mating an image intensifier section to the image isocon. Experience gained in making the image isocon has shown that isocon operation can be achieved with relatively little change in the standard image orthicon set-up procedure. (Author)

AD-258 631 Div. 8, 25
(28 June 61) OTS price $2.60

Florida U. Engineering and Industrial Experiment Station, Gainesville.
STUDY OF ELECTRO-MAGNETIC PROPAGATION OF A TRANSIENT SIGNAL THROUGH SEA WATER,
by M. J. Larsen, M. H. Latour, and M. M. Newman. Apr 61, 25p. incl. illus. tables (Technical rept. no. 1)
(Contract Nonr-58010)

Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Propagation, Attenuation, *Underwater radio transmission, *Underwater radio reception, Nonlinear systems, Water, Sea water, Tests, Pulse generators, Capacitors.

The results of an experimental study of the propagation characteristics of sea water for a high-power electromagnetic transient wave are presented. The methods of the transient wave generation and reception are described. The results consider the non-linear frequency characteristics of the medium as they relate to the attenuation and delay of the propagated wave. The observed transient received signal characteristics as a function of both distance and depth are compared with those calculated for continuous-wave signals in sea water medium. (Author)

AD-258 642 Div. 8
(28 June 61) OTS price $2.60

Applied Research Lab., U. of Arizona, Tucson.
SELECTIVE AMPLITUDE SAMPLING,
by Leo R. Spogen, Jr., Harry N. Shaver and others. Final rept. Jan 61, 30p. incl. illus.
(Supplement no. 1 to AD-210 550)
(Contract DA 36-039-sc-80146)
(Supplement no. 1 to AEPG-SIG 960-73)

Unclassified report

DESCRIPTORS: *Communication theory, *Speech transmission, *Speech representation, Sampling, *Amplitude modulation, Selection, Communication systems.

This report discusses selective amplitude sampling which may be used in rf transmission in the form of pulse amplitude modulation, pulse duration modulation, or pulse position modulation. The techniques that may be used to obtain these modulation forms are discussed. A preliminary discussion of noise properties that will produce a degradation of intelligibility and quality of the signal in these basic forms is included. (Author)

AD-258 648 Div. 8
(28 June 61) OTS price $6.60

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
ACCEPTANCE TESTING OF A 12.5-MW CERAMIC HYDROGEN THYRATRON, VOLUME I,
by Daniel F. Riley. Final rept. vol. 1, 15 June 58-15 Dec 60. 27 Mar 61, 64p. incl. illus. tables (Rept. no. B-2220)
(Contract DA 36-039-sc-78038)
Unclassified report

DESCRIPTORS: *Thyratrons, Electron tubes, Ceramic materials, Hydrogen, Design, Life expectancy, Tests, Production, Quality control, Discharge tubes.

Problems encountered during the acceptance-testing program on the 12.5-megawatt hydrogen thyratron are discussed, and warmup-time investigations are described. Life-test data on standard and modified-design tubes, special test data, and initial operating characteristics of tubes currently in production are presented. Ratings and test conditions from the final tube specification are also included. Manufacturing specifications and drawings of the 12.5-megawatt hydrogen thyratron are presented in AD-258 649. (Author)

AD-258 649 Div. 8, 26
(28 June 61) OTS price $8.10

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
ACCEPTANCE TESTING OF A 12.5-MW CERAMIC HYDROGEN THYRATRON. VOLUME II,
by Daniel F. Riley. Final rept. vol. 2, 15 June 58-15 Dec 60. 27 Mar 61, 1v. incl. illus. (Rept. no. B-2220A)
(Contract DA 36-039-sc-78038)
Unclassified report

DESCRIPTORS: *Thyratrons, Electron tubes, Ceramic materials, Hydrogen, Specifications, Design, Discharge tubes, Processing, Manufacturing methods, Electrolyte polishing, Molybdenum, Nickel, Copper, Titanium, Materials.

Contents:
Process specifications
  Cleaning
    Molybdenum
    Kovar
    Nickel
    Copper
    Ceramic
    Titanium washers
    Solder and brazing material
  Electropolishing
    Grid cup
    Nickel
    Molybdenum
  Spraying
    Cathode vanes
    Titanium hydride
    Preparation of methocel for TiH2 spray
  Fabrication
    Cathode heater
Construction procedure
Drawings

AD-258 658 Div. 8
(28 June 61) OTS price $8.10

Geophysics Corp. of America, Bedford, Mass.
A CONVERSION TABLE FOR WAVELENGTHS TO ELECTRON VOLTS,
by J. A. R. Samson. Apr 61, 82p. incl. tables.
(GCA Technical rept. no. 61-5-N)
(Contract NASw-124)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, Ultraviolet radiation, *Electric potential, Conversion ratio, Voltage, Tables.

AD-258 667 Div. 8
(28 June 61) OTS price $4.60

Kidde, Walter, and Co., Inc., Belleville, N. J.
STATIC SWITCHING DEVICES,
by Richard Gilbert. Quarterly progress rept. no. 6, 1 Feb-30 Apr 61. 30 Apr 61, 38p. incl. illus. tables (Rept. no. 2202-Q6)
(Contract DA 36-039-sc-85240)
Unclassified report

DESCRIPTORS: *Switching circuits, *Electronic relays, Transistors, Tests, *Electronic circuits, Waveform generators, Diodes, *Electronic switches, Oscillators, Oscillator circuits, Design, Semiconductors, Electric bridges.

A signal switching relay using a symmetrical transistor as the contact was developed which gives good performance for low level signals at frequencies in or below the audio range. A drive circuit for a low level relay using a diode bridge as the contact was developed. A current rating of 3a at 85 C was established for the current relay. (Author)

AD-258 700 Div. 8, 25
(28 June 61) OTS price $11.00

Nuclear Corp. of America, Denville, N. J.
(No title). Research and Development Final rept. 27 May 59-27 Nov 60. 27 Nov 60, 138p. incl. illus. tables, 26 refs.
(Contract NObsr-77591)
Unclassified report

DESCRIPTORS: *Cold cathode tubes, Electron tubes, Design, *Cathodes (Electron tubes), Silicon, *Semiconductors, Materials, Field emission, Theory.

A study was made of the concept of a novel cold cathode electron power tube category designated COCAT in order to obtain an emission current comparable to or greater than that obtainable using a hot cathode. A detailed study was made on Si in an attempt to determine experimentally those parameters that control and influence the COCAT emission. Emission current was increased by a factor of 10,000 from currents of the order of 10 to the -13th power to a level of 10 to the -9th power as a result of a systematic study of low work function impurities. The 10,000 factor increase in emission was obtained from COCAT junctions prepared by the vapor diffusion at a high temperature of Cs into p-type Si. Simultaneous with the Si COCAT development, an experimental survey was conducted on semiconductor materials other than Si, such as SiC, CdS, ZnO, GaP, AlSb, InP, GaAs, and the rare earth nitrides of Dy, Ho, Yt, and Er. A theoretical treatment for the COCAT emission current and its associated noise was worked out which involves the adaptation of a modified distribution previously developed for the avalanche breakdown of p-n junctions.

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-258 702 Div. 8
(28 June 61) OTS price $7.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
AN INVESTIGATION OF THE JUNGLE GYM PERIODIC STRUCTURE,
by Bernard Mohr. 9 May 61, 69p. incl. illus. 28 refs. (Research rept. no. PIBMRI-892-61)
(Contract AF 18(600)1505)
(AFOSR-792) Unclassified report

DESCRIPTORS: *Waveguides, *Linear accelerators, *Traveling wave tubes, Perturbation theory, Impedance, Cavity resonators, Electron accelerators, Mathematical analysis, Propagation, Radiofrequency filters, Waveguide filters, Wire, *Microwave equipment, Resonance.

A jungle gym periodic structure, an array of square bars contained within a square waveguide is discussed; it is suitable for use, both, as a linear accelerator, and for high power traveling wave tubes, since heat can be conducted directly to the walls of the guide. Characteristics of the jungle gym, determined experimentally, are the propagation characteristics, internal Q, and coupling impedance. Resonance frequency measurement, tangent method, and the perturbation technique, necessary in order to obtain the above-mentioned characteristics, are given. In addition, a structure, the wire loaded cylindrical guide structure, closely related to the jungle gym, is described. Both structures exhibit a slow backward fundamental space harmonic and large bandwidth. Bandwidths obtained for the jungle gym structure, dependent on its periodic length, range from about 2000 to 3600 mc, with an approximate midband frequency of 4700 mc. (Author)

AD-258 722 Div. 8
(29 June 61) OTS price $2.60

Sperry Gyroscope Co., Great Neck, N. Y.
HIGH AVERAGE-POWER R-F WINDOW STUDY,
by D. B. Churchill and E. W. Cheatham. Quarterly memo. no. 1, 26 Jan-26 Apr 61. May 61, 19p. incl. illus. (Sperry rept. no. NA-8220-8261-1)
(Contract AF 30(602)2428, Proj. 5573)
Unclassified report

DESCRIPTORS: *Microwave equipment, *Waveguide windows, Dielectrics, Electron bombardment, Test facilities, Aluminum compounds, Oxides, Beryllium compounds, Silicon compounds, Dioxides, Synthetic gems, Sapphires, Cavity resonators, Electron guns, Waveguide couplers, *Waveguides, Liquids, Single crystals, *Electron tubes.

A theoretical and experimental investigation of dielectric materials was conducted in order to select those materials most favorable for application in high average-power waveguide windows. The materials to be studied include high-purity aluminas and beryllias, synthetic sapphire, fused silica, and certain dielectric liquids. A high-energy electronic bombarder was designed and constructed, and the first series of tests was completed. The components of the high-power ring resonator were designed and partly fabricated. Special problems associated with the power-monitor coupler, the hybrid couplers, and the sliding choke plungers were approached and tentatively solved. A new type of compression flange for high-power use was developed. A new and unusual design of a high-power water load using a waveguide window was initiated. Two designs were started for test window sections. (Author)

AD-258 724 Div. 8
(29 June 61) OTS price $4.60

Institute of Mathematical Sciences, New York U., N. Y.
PERTURBATION METHODS IN A PROBLEM OF WAVEGUIDE THEORY,
by D. Fox and W. Magnus. Apr 61, 40p. incl. illus.
(Research rept. no. EM-168)
(Contract AF 19(604)5238)
(AFCRL-179) Unclassified report

DESCRIPTORS: *Waveguides, Theory, *Perturbation theory, Conformal mapping, Linear systems, Equations, Mathematical analysis, Electrostatic fields, Series, Fourier analysis, Matrix algebra.

The reflection coefficient for the basic mode in a widening, straight, two-dimensional waveguide is computed for small wave numbers by using the perturbation method with the electrostatic case as the unperturbed case. Essential features of the treatment are the use of conformal mappings, the consideration of physically unreal modes, and the inversion of an infinite matrix. (Author)

AD-258 729 Div. 8, 5
(29 June 61) OTS price $6.60

Electro-Mechanical Research Inc., Sarasota, Fla.
DEMULTIPLEXER-MULTIPLEXER TD- ( )/GSC.
Technical note, 1 June 61, 1v. incl. illus.
(Contract AF 30(602)2357, Proj. 5570)
(RADC TN 61-90) Unclassified report

DESCRIPTORS: *Multiplex transmission, *Telephone communication systems, Speech, Speech transmission, Delay circuits, Delay lines, Electronic circuits, Synchronizers, Communication systems, Intelligibility, Tests, Design, Reliability, Voice communication systems, Signal to noise ratio.

Research was concerned with the development of a three-channel speech-processing equipment capable of transmitting and receiving three telephone messages simultaneously. The goal of simultaneous transmission of three voices over a single speech channel is accomplished through speech reiteration principles. The results of this program include circuit design and testing of the basic system concept. Results show that the concept is valid, that there are excellent possibilities for further improvement, and that other applications for the basic concept need investigation. (Author)

AD-258 735 Div. 8, 19
(29 June 61) OTS price $1.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
MODIFICATION OF STANDARD ALFORD LOOP ANTENNA FOR USE ON DOPPLER VOR,
by S. E. Taggart. Final rept. Feb 61, 13p. incl. illus.
Unclassified report

DESCRIPTORS: Radio ranges, Radio stations, *Loop antennas, Tests, Transmission lines, *Doppler navigation, Distortion, Reduction, Sidebands, Capacitors, Antennas, Design.

The standard Alford loops used in the Doppler VHF omnidirectional range (VOR) antenna array were modified and tests conducted to determine the reduction in parasitic current achieved as a result of the modification. It is concluded that

the parasitic currents in the Alford loops of the Doppler VOR antenna array can be reduced appreciably by tuning the transmission line portions of the individual loops with a parallel plate capacitor. A further reduction in parasitic current can be effected by positioning the loops so that the transmission line crossovers are in line with the periphery of a circle through the centers of the loops and by alternating crossovers on either side of loop centers. (Author)

AD-258 736 Div. 8
(29 June 61) OTS price $1.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
A STUDY OF VOR REFLECTION CHARACTERISTICS,
by Sterling R. Anderson and John Turk. Final rept. Mar 61. 15p. incl. illus.
Unclassified report

DESCRIPTORS: *Radio ranges, *Radio stations, Antennas, *Loop antennas, Reflection, Very high frequency, South Carolina, Tests, Wire, Reflectors, *Radio fields, Measurement, Radio waves, *Radio signals.

Frequently a VHF omnidirectional range (VOR) station must be located at a site which is far from desirable. The 4-loop VOR installation at Charleston, S. C., was situated at the center of a 2,000-ft-diameter cleared space in a wooded area. The station could not be commissioned because of excessive course scalloping, and the condition was not improved greatly even by mounting the antenna system on top of a 75-ft-high counterpoise 150 ft in diameter. Tests were conducted with a vertical screen made of horizontal wires to determine the effectiveness of a large counterpoise 75 ft high in reducing scalloping caused by reflecting objects beyond 1,000 ft from a VOR antenna. It is recommended that no further consideration be given to using a counterpoise 150 ft in diameter and 75 ft high for reducing course scalloping caused by objects greater than 1,000 ft away from a 4-loop VOR antenna. (Author)

AD-258 776 Div. 8
(29 June 61) OTS price $8.10

Rome Air Development Center, Griffiss Air Force Base, N. Y.
SURVEY OF GROUND RADOMES,
by Robert B. Curtis and Joseph Vaccaro. May 61, 75p. incl. illus. 96 refs. (Rept. no. RADC TR 61-52)
(Proj. 5579)
Unclassified report

DESCRIPTORS: *Radomes, *Radar equipment, Antennas, Design, Radar antennas, Materials, Glass textiles, Plastics, Reinforcing materials, Foams, Polymers, Urethanes, Synthetic rubber, Rubber coatings, Polarization, Standing wave ratios.

The results of a survey of the current state of the art in large ground radomes for military applications are presented. The purpose of the survey was to examine the directions of current structural and electromagnetic design of large ground radomes; summarize what has been learned about the effects of various radome structures on antenna performance; and list the principal characteristics of some typical radomes. (Author)

AD-258 781 Div. 8
(29 June 61) OTS price $4.60

Varian Associates, Palo Alto, Calif.
DEPRESSED COLLECTOR KLYSTRON (VA-843) DEVELOPMENT PROGRAM,
by E. McCune. Final rept. Mar 61, 40p. incl. illus. (Engineering rept. no. 237-1F)
(Contract DA 36-039-sc-78093)
Unclassified report

DESCRIPTORS: *Klystrons, Design, *Microwave amplifiers, Tests, Regeneration, Electric fields, Electrostatic fields, Electrodes, Electron tubes, Amplifiers.

The design, development, and construction of the VA-843 depressed collector klystron is described. Initial experimental results obtained with standard klystrons operated under depressed collector conditions are given, along with the data of experimental collectors designed specifically for the VA-843 klystron. Problems encountered with high- and low-speed primary and secondary electrons are detailed, including the collector modifications tested as possible solutions. Difficulty was encountered in maintaining a vacuum of better than 10 to the -6th power mm Hg, and it was necessary to attach a pump permanently to the tube. The carbon coated grid wires presented the most serious problem. It has been found that the carbon coating on the tungsten grid was very effective in keeping the secondary current low. However, the temperature at which the grid operated was very critical and, if the grid was overheated, the carbon reacted with the tungsten. The resulting tungsten carbide, being extremely brittle, broke with the slightest tube vibration, allowing pieces of wire to fall into the tube. Also, it was necessary to exercise caution in mounting the grid during assembly so that the carbon coating was not removed. (Author)

AD-258 784 Div. 8, 7, 14
(29 June 61) OTS price $3.60

Battelle Memorial Inst., Columbus, Ohio.
SERVICES, INVESTIGATIONS, AND TESTS ON STANDARD AND NONSTANDARD PARTS AND MATERIALS,
by W. E. Chapin. Final summary rept. 1 May-30 Nov 60 on Resistors, Evaluation of Body Enclosures. 30 Nov 60, 38p. incl. illus. tables.
(Contract DA 36-039-sc-85294)
Unclassified report

DESCRIPTORS: *Resistors, Films, *Seals, Encapsulation, Ceramic capacitors, Ceramic materials, Plastic seals, Glass seals, Glass resistors, Soldered joints, Moisture-proofing, Test methods, Phthalates, Tests, *Sealing compounds, Metal seals.

An investigation was made (1) to determine which moisture-resistance test method or test sequence of pretreatments is most sensitive in differentiating between molded plastics and ceramic resistor body enclosures, (2) to determine whether leak-detection procedures outlined in military specifications can be used with moisture-resistance cycling as a pretreatment and a performance test, and (3) to explore the possibility of whether the static-humidity test can discriminate effectively between 2 distinctly different types of resistor body enclosures. Film-type resistors from 6 sources were subjected to (1) extensive moisture-resistance tests, (2) lead-strength tests, (3) solder-dip application, (4) temperature cycling, (5) salt-water immersion, (6) lead-strength test followed by salt-water immersion, and (7) static-humidity effects. Ten moisture-resistance cycles were sufficient to indicate

that resistors with epoxy-tube enclosures and conformal coatings were different from and inferior to other body-enclosure types. Separating the glass, ceramic, and diallylphthalate enclosures in accordance with their differences in degradation rate under repeated moisture-resistance cyclings was not feasible.

AD-258 789 Div. 8, 25
(30 June 61) OTS price $11.00

General Electric Co., Syracuse, N. Y.
SOLID STATE COMMUTATOR STUDY.
Final rept. 15 Feb 60-31 Mar 61. 31 May 61, 136p. incl. illus. tables, 15 refs.
(Contract AF 30(602)2164)
(RADC TR 61-129) Unclassified report

DESCRIPTORS: *Photoconductivity, Switches, *Electronic switches, *Electronic commutators, *Switching circuits, Interference, Noise (Radio), Transistors, Cadmium compounds, Sulfides, Photometers, Electrical networks, Feedback, Electronic circuits.

Research concerns the establishment of techniques for the design of a solid state commutator utilizing photoconductive and electroluminescent cells. The operating characteristics of these components were investigated to determine their capabilities as elements of a switching device. The most feasible types of photoconductor switching networks were analyzed and the development and measurements of each are described. Properties particularly considered are the ON/OFF output ratio, attenuation, capability of handling large numbers of inputs, linearity, and noise level. An 8 channel commutator, utilizing the developed T-section switch and binary grouping output, was constructed and tested. Bandwidth and minimum signal levels are discussed in terms of the design predictions. (Author)

AD-258 795 Div. 8, 6
(12 July 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN INFRARED IMAGE TUBE FOR THE SPECTRAL REGION OF 1 TO 40 MICRONS,
by R. J. Keyes. 5 July 60. 7p. incl. illus. table (Rept. no. 85G-0004, supersedes rept. no. 85G-0004, AD-239 488)
(Contract AF 19(604)5200)
Unclassified report

DESCRIPTORS: *Infrared image tubes, Design, Electron tubes, Infrared images, Photoconductivity, Phototubes, *Image converter tubes, *Image tubes.

Efforts were made to fabricate a device that will continuously transform infrared images into visible reproductions. Converters which utilize the photoconductive process, in general have high sensitivity, high speed of response and spectral characteristics which are intrinsic to the particular photoconductor. This type rather than one based on the thermal principle or the photoemissive principle was selected. The tube proposed utilizes a photoconductor sensitive out to 40 microns and a photoemitting surface sensitive in the visible portion of the spectrum. Characteristics of this tube are described. The proposed tube has all the advantages associated with Vidicon operation, plus the additional advantage that a wide variety of photoconductors can be used, whose resistivity is not suitable for Vidicon conversion. The pilot tube has demonstrated the validity of the image conversion concept.

AD-258 850 Div. 8
(30 June 61) OTS price $2.60

Schwinger, Julian, Cambridge, Mass.
INVESTIGATION OF HIGH FREQUENCY LIMITATIONS IN MILLIMETER WAVE GENERATORS,
by Julian Schwinger. Final rept. Nov 60-May 61. May 61, 1v.
(Contract DA 36-039-sc-85326, Proj. 3A99-13-001)
Unclassified report

DESCRIPTORS: *Radiofrequency generators, *Microwaves, Quantum mechanics, Electromagnetic fields, *Cavity resonators, Mathematical analysis, Harmonic oscillators, Electromagnetic effects.

The development of a quantum-mechanical formalism for systems with dissipation that was presented earlier, and intended mainly for application to the electromagnetic field in a cavity, is extended. The problem of the harmonic oscillator with dissipation is shown to be the same as that of a harmonic oscillator coupled to a thermal reservoir, and the need of the formalism to contain the appropriate statistical mechanics is discussed. The derivation of relationships which permit the calculation of all moments of the oscillator coordinate or momentum provides the necessary extension of the theory. The formal resemblance of the completed theory to that of classical Brownian motion, some differences due to quantum mechanics, and the fact that certain fundamental relationships which are assumed in the latter are derived in the present analysis, are pointed out. The application of the theory is illustrated by the consideration of 3 problems: the proof of Ott's formula, and the derivation of both the probability density and energy distribution of the oscillator in equilibrium with a thermal reservoir. (Author)

AD-258 861 Div. 8, 15, 30
(13 July 61) OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
ADAPTIVE BINARY DETECTORS,
by R. F. Daly. 26 June 61, 25p. incl. illus.
(Technical rept. no. 2003-2)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Communications theory, *Radio signals, Correlation techniques, Radiofrequency filters, Matrix algebra, Integral equations, Probability, Sequences, Memory devices, Noise analyzers, Diversity reception.

A sequential binary detection problem is considered in which it is required to detect the presence of absence of a stochastic signal in each member of a sequence of observations perturbed by additive noise. The problem is formulated so that the decision rule for the (k1) observation depends on a memory function of the previous k observations. The resulting decision rule which minimizes the probability of making a detection error is complicated by the fact that it is not known which of the past observations actually contain the unknown signal. A time-varying linear predictor of the unknown signal is introduced as the memory function, and a binary detector with a variable structure depending on the linear predictor is discussed. (Author)

AD-258 863 Div. 8
(30 June 61) OTS price $4.60

Electronic Defense Labs., Mountain View, Calif.
TRANSISTORIZED TWENTY-PULSE GENERATOR,
by Ralph W. Leurgans and Harold Thiel. 14 Apr 61, 40p. incl. illus. (Technical memo. no. EDL-M346)
(Contract DA 36-039-sc-85402)
Unclassified report

DESCRIPTORS: *Pulse generators, Transistors, Miniature electronic equipment, Design, *Sweep generators, *Relaxation oscillators, *Pulse modulation, Tests, Electronic circuits, Delay circuits.

A transistorized multipulse generator is described which was designed, built, and tested to evaluate problems encountered in miniaturization of multipulse generators. Individual units of the generator are described, and results of various tests are reported. It is concluded that transistorized multipulse generators are feasible, and that their space and power requirements are considerably reduced over those of a tube-type generator. Cost of transistorized units is higher, however. (Author)

AD-258 866 Div. 8, 12
(30 June 61) OTS price $4.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STABILITY STUDIES OF QUARTZ CRYSTALS FOR SATELLITES,
by R. B. Belser and W. H. Hicklin. Quarterly rept. no. 3, 1 Jan-1 Apr 61, 34p. incl. illus. tables.
(Contract DA 36-039-sc-85363)
(ARPA Order no. 54-60) Unclassified report

DESCRIPTORS: *Quartz resonators, *Satellite vehicles, Quartz crystals, Very high frequency, Instrumentation, Stability, Silver, Aluminum, Frequency, Measurement, Cesium, Van Allen radiation belt, Van de Graaff generators.

The frequency measurement problem was resolved. By the adoption of a single-ended capacitance bridge and the application of automatic gain control to the driving oscillator, frequency measurements to within + or - 2 parts in 100,000,000 were obtained. Fifty, fifth-overtone, 100 mc resonators were fabricated. Selected 100 mc resonators, aged at 60 degrees, continued to show minimal aging of less than 1 part in 10,000,000 in 6 months; very low aging was experienced at 0 C for similarly fabricated units. Twelve resonators were exposed to radiation from a 12,000 curie cesium-137 source and two to 1 Mev protons from a Van de Graaff Accelerator. The units exposed at high intensities (1.4 x 1,000,000 rad/hr) to the cesium source for 10 to 30 min shifted downwards up to 10 ppm. Aluminum-plated resonators exhibited somewhat greater shifts than silver-plated ones. Resonators exposed for on hour to radiation about equivalent to the intensity of the Van Allen Belt shifted downward an average of only 20 c. Two resonators exposed to the Van de Graaff proton beam for one sec shifted one and 33 c, respectively. (Author)

AD-258 867 Div. 8
(12 July 61) OTS price $3.60

Electron Tube Lab., U. of Michigan, Ann Arbor.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF LARGE-SIGNAL TRAVELING-WAVE TUBES,
by H. K. Detweiler, G. T. Konrad and others. Quarterly progress rept. no. 3, 1 Jan-1 Apr 61. Apr 61, 33p. incl. illus. (Rept. no. 037366-P)
(Contract AF 30(602)2303, Proj. 5573)
(RADC TN 61-98) Unclassified report

DESCRIPTORS: *Traveling wave tubes, Test sets, Design, Mathematical analysis, Helixes, Ultra high frequency, S band, Amplifiers, Electron tubes, *Electron guns, *Electron beams, *Microwave amplifiers, Phase shifters, Phase measurement.

A relativistic analysis of the traveling-wave amplifier has been developed both for small- and large-signal conditions. A limited number of calculations were made with the principal result being that the small-signal gain is decreased at relativistic electron velocities whereas the saturation efficiency is increased. The modulation characteristics of the S-band Crestatrons were determined by making relative phase shift measurements as a function of RF drive level, modulating voltage and frequency. Excellent agreement was obtained between calculated phase shift and measured values and over an extended range of voltage swing the phase shift varied linearly. The phase shift was nearly constant over a wide range of drive levels at low power outputs and then decreased significantly at high drive levels. A computer program to optimize efficiency by holding one electron phase-focused was developed. Extensive experimental data of UHF Crestatron No. 3 are presented; power outputs of 3-4 kw have been obtained with an octave bandwidth. The electron gun tester and analyzer was nearly completed and a limiting vacuum pressure of 6 x 1/100,000,000 mm of Hg was obtained. (Author)

AD-258 868 Div. 8
(30 June 61) OTS price $1.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, VARIABLE (FILM TYPE),
by John Woods. Quarterly progress rept. no. 11, 1 Dec-28 Feb 61. 28 Feb 61, 12p.
(Contract DA 36-039-sc-75981)
Unclassified report

DESCRIPTORS: *Variable resistors, Quality control, Manufacturing methods, Films, Tests, Carbon alloys, Laminates, Resistors.

Inspection of the RV11 substrates (3-piece and 1-piece) showed that the dimensions were within tolerance but the surface finish was too rough and too variable. Attempts to process these substrates proved futile because of poor adhesion of film to substrate on the highly-polished areas. Manicuring of equipment is pending receipt of acceptable substrates. Premalloy was selected as the material for the center terminal. (Author)

AD-258 890 Div. 8
(3 July 61) OTS price $3.60

Electronics Research Lab., U. of Calif., Berkeley.
SPACE-CHARGE INSTABILITIES IN ELECTRON DIODES AND PLASMA CONVERTERS,
by Charles K. Birdsall and William B. Bridges. 26 Jan 61, 29p. incl. illus. table, 20 refs.
(Series no. 60, Issue no. 343)
(Contract AF 49(638)102)
(AFOSR-387) Unclassified report

DESCRIPTORS: *Space charges, *Diodes, Electron tubes, Electrodes, Noise (Radio), Plasma oscillations, Reduction, Stability, Beam power tubes, Tetrodes, Tests, Particle trajectories, Electron charge.

Space-charge instabilities in diodes were found to produce variations in potential and current that are larger than predicted from classical static analyses and, moreover, which produce sustained electro-kinetic oscillations. The classical static solution is reviewed and the new transient solution is presented briefly. As applications, tentative explanations are offered for recent observations of extra shot-noise smoothing and of oscillations in thermionic converters. (Author)

AD-258 946 Div. 8, 20
(7 July 61) OTS price $7.60

Convair, Fort Worth, Tex.
THE EFFECTS OF REACTOR RADIATION ON THE ELECTRICAL PROPERTIES OF ELECTRONIC COMPONENTS. PART VII. RESISTORS AND VACUUM TUBES,
by E. E. Palmer and D. Howell. 7 June 61, 74p. incl. illus. tables (Document no NARF-61-5T; Rept. no. NR-N-268)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Electron tubes, *Resistors, Radioactivity, *Radiation effects, *Radiation damage, Tests, Test reactors, Electrical properties, Electronic equipment, Pentodes, Diodes.

Several types of vacuum tubes and resistors were irradiated at Convair-Fort Worth with the Ground Test Reactor for a period of 100 hours at a power level of 1 megawatt. Data were taken on the components before, during, and after the irradiation. The vacuum tubes received a maximum radiation exposure of 8.64 x 10 to the 15th power nf/sq. cm and 3.9 x 10 to the 10th power ergs/gm(C). A small increase in the average plate current was noted for all tube types. Pentodes subjected to the high-flux field exhibited the largest percent change (approx. 6%) while diodes remained relatively unaffected at these radiation levels. The resistors received a maximum radiation exposure of 1.4 x 10 to the 16th power nf/sq. cm and 6.2 x 10 to the 10th power ergs/gm(C). The degree of damage was dependent upon the material and type of construction of the individual resistor types. The maximum observed change (approx. 6%) occurred in the RC41 fixed-composition resistors. (Author)

AD-258 949 Div. 8
(3 July 61) OTS price $7.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A REPRESENTATION OF MICROWAVE ONE-PORT CAVITIES,
by G. Persky. 4 May 61, 65p. incl. illus.(Research rept. no. PIBMRI-912-61)
(Contract AF 18(600)1505)
(AFOSR-797) Unclassified report

DESCRIPTORS: *Cavity resonators, Microwaves, Microwave oscillators, Mathematical analysis, Instrumentation, Tests, Algebra, Electronic circuits, *Microwave networks, Transmission lines, Waveguides, Dielectrics.

The theoretical basis for representing one-port cavities by means of a modified Wheeler representation, i.e., a representation which includes transformers, transmission lines, and ideal attenuators, and which more closely resembles a physical cavity, is given. Formulas and techniques for abstracting the pertinent parameters from experimental data are also presented. Two configurations are considered: a simple (empty) cavity and one which is partially loaded with a dielectric material. It is shown that in practical cases both of these cavities, and by inference more complicated ones, can be represented by the same simple network. Experimental results substantiating the theory have been offered. In contrast to the usual RLC representation, the present representation makes it possible to obtain the network parameters, when necessary, from a knowledge of the physical cavity components. In addition, because of the direct relationship which the network parameters bear to the cavity components, the effect on cavity behavior which results when the values of individual components are changed can be readily determined. (Author)

AD-258 950 Div. 8
(3 July 61) OTS price $1.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
INVESTIGATION OF HIGH FREQUENCY PROPAGATION IN THE IONOSPHERE USING SATELLITE TRANSMISSIONS,
by W. J. Ross. Quarterly status rept. no. 7, 15 Jan-15 Apr 61. 15 Apr 61, 15p.
(Contract AF 33(616)6157)
Unclassified report

DESCRIPTORS: *Ionospheric propagation, High frequency, *Extraterrestrial radio waves, *Radio transmission, Satellite vehicles, *Ionosphere, Tests, Data processing systems, Doppler systems, Radio beacons, Airborne, *Upper atmosphere, Theory.

Propagation effects on radio waves transmitted from earth satellites, produced as they pass from vehicle to ground through the ionized upper atmosphere, were measured and evaluated in terms of the ionospheric conditions producing them. From these data information was obtained concerning the ionosphere below the satellite altitude. Over an extended period the variation in satellite orbital parameters together with statistical data processing methods enabled further deductions to be drawn from the experimental data. The resultant knowledge of ionosphere properties and behavior under varying conditions provided a test for theories of the ionosphere. (Author)

AD-258 960 Div. 8
(30 June 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
LEAKY-WAVE ANTENNAS USING PERIODICALLY SPACED SMALL APERTURES,
by Wm. J. Getsinger. Mar 61, 43p. incl. illus. tables, 18 refs. (Scientific rept. no. 10)
(Contract AF 19(604)3502)
(AFCRL-335) Unclassified report

DESCRIPTORS: *Antennas, Design, Waveguides, Dielectrics, Theory, Equations, Functions, Antenna horns.

The application of Bethe's small-aperture theory and leak-wave-antenna theory to the design of

narrow-beam antennas radiating through small apertures periodically spaced along one wall of a rectangular waveguide is described. The first antenna described uses a dielectric-filled rectangular waveguide with rectangular apertures spaced along one narrow wall radiating into a parallel-plate region, which flares into a horn. This antenna was 30 inches long and was designed for a center frequency of 11.0 Gc. It gave reasonably good patterns from about 10.4 to 11.8 Gc., scanning from about 55 degrees to 25 degrees, measured from the waveguide axis. The beamwidth was between 4.75 degrees and 6.5 degrees in this frequency range. The other antenna described is a single rectangular waveguide designed to be part of an array of waveguides laid side-by-side radiating through crossed slots in their broad walls. This antenna radiated an elliptically polarized wave, but the design analysis is applicable to linear polarization as well. The antenna was 20 inches long. It scanned a five-degree beam through about 22 degrees, with an ellipticity less than six db, over a 25% frequency band centered at about 9.0 Gc. (Author)

AD-258 961 Div. 8
(30 June 61) OTS price $5.60

Stanford Research Inst., Menlo Park, Calif.
FLUSH-MOUNTED SURFACE-WAVE LAUNCHER,
by M. G. Andreasen. Mar 61, 47p. incl. illus. 12 refs. (Scientific rept. no. 11)
(Contract AF 19(604)3501)
(AFCRL-358) Unclassified report

DESCRIPTORS: *Waveguides, *Slot antennas, Waveguide couplers, Transmission lines, Magnetic fields, Electric fields, Dielectrics, Experimental data, Theory, Antennas, Waveguide slots.

An investigation of a flush-mounted surface-wave launcher of very high efficiency is reported. The launcher consists of an array of partially dielectric-filled waveguides coupled to a dielectric slab outside the waveguides by small slots cut in the broad faces of the waveguides. The launcher supports two normal modes with slightly different phase velocities. All power can theoretically be extracted from the waveguide system for a coupling length of one-half beat wavelength of the normal modes, provided that the dimensions of the launcher are chosen so that the following two conditions will be satisfied: (1) the normal modes of the uncoupled system must have the same phase velocity; and (2) each normal mode of the coupled system must carry the same power inside as outside the waveguides. Satisfying these conditions for a 7.5-wavelength-long experimental launcher, it was possible to extract more than 99.9% of the power from the waveguides. The theory was also used to design a surface-wave launcher which couples one rectangular waveguide to a dielectric slab with metal sides. Furthermore, the theory was applied to predict the coupling between two rectangular waveguides. (Author)

AD-258 968 Div. 8
(3 July 61) OTS price $4.60

Technical Research Group, Inc., Somerville, Mass.
A PRELIMINARY INVESTIGATION OF WAVEGUIDE STRUCTURES SUITABLE FOR ELECTROMECHANICAL SCANNING,
by Alan J. Simmons. 9 Feb 61, 1v. incl. illus. table (Scientific rept. no. 3; TRG-121-SR-3)
(Contract AF 19(604)3476)
(AFCRL-315) Unclassified report

DESCRIPTORS: *Waveguides, *Phase shifters, *Waveguide slots, Measurement, Design, Tests, *Transmission lines, Resonance, Velocity, Dielectrics.

Two mechanically simple methods of varying the phase velocity in rectangular waveguide are presented. Both rely on periodic loading of the waveguide to change the phase velocity. The amount of this change is varied by alternately covering and uncovering the periodic structure by means of a slider in an auxiliary channel parallel to the main waveguide. The first method which consisted essentially of covering and uncovering inductive corrugations in the waveguide wall exhibited inherent resonances in the slow-wave region and is thus useful only for increasing the normal phase velocity. The second method consisted of covering and uncovering inductive non-radiating slots in the waveguide wall and proved to give sufficient phase shift to obtain 20 degrees of scan near broadside or 40 degrees of scan near endfire. The serious problems of ohmic loss in these structures, and of coupling a slot array to the waveguide were only briefly studied. (Author)

AD-258 969 Div. 8
(3 July 61) OTS price $5.60

Technical Research Group, Inc., Somerville, Mass.
FAR FIELD PATTERNS OF POLYGONAL APERTURE ANTENNAS,
by Alan F. Kay. 13 Feb 61, 1v. incl. illus.
(Scientific rept. no. 3; TRG-131-SR-3)
(Contract AF 19(604)5532)
(AFCRL-316) Unclassified report

DESCRIPTORS: *Antennas, *Antenna radiation patterns, Lobing, Configuration, Reduction, Design, Mathematical analysis.

The cutting or contouring of antenna apertures in irregular ways to lower the sidelobe levels has been systematically studied theoretically and by means of a digital computer program. Sidelobe levels of contours having the same amplitude taper which are affinely equivalent, such as the circle and the ellipse, have the same far field patterns except for scale factor. Taking the sidelobe levels of a circular contour as a standard, it is shown that for a given amplitude taper, sidelobe levels of polygonal contours close to the circle are higher than that of the standard in some cuts, lower in others. Certain contours such as triangles or regular stars with 10 or more points do, however, have lower sidelobe levels in all cuts. 32 contour plots are presented of patterns of stars and regular, semi-regular, and irregular polygons. (Author)

AD-258 973 Div. 8, 25
(13 July 61) OTS price $8.60

Michigan College of Mining and Technology, Houghton.
ANALYSIS OF DIFFRACTION PATTERNS ON THE GROUND CAUSED BY IONOSPHERIC IRREGULARITIES,
by Donald G. Yerg. Mar 61, 90p. incl. illus. tables (Scientific rept. no. 1)
(Contract AF 19(604)3867)
(AFCRL-481) Unclassified report

DESCRIPTORS: *Ionospheric propagation, *Diffraction, Drift, Correlation techniques, Diurnal variations, Statistical tests, *Radio waves, Partial differential equations, Digital computers, Tables, Radio transmission.

Radio fading records obtained on spaced receivers

for 2.33 mc/s at Mayaguez, Puerto Rico were made available for analysis. A method for determining the average drift velocity and the instantaneous normal departure velocity of the lines of constant signal intensity was developed and applied. The method also provides data related to the shape and orientation of the signal pattern. The procedure is based upon the evaluation of the space and time derivatives of the observed signal intensity. The results indicate differences in the dynamic characteristics of the signal pattern associated with day and night conditions. A sharp decrease in the drift speed is noted after midnight. The random motion of the ground pattern is anisotropic and is related to the anisotropy of the pattern. A sequence of short-period random pulses superimposed on a more or less regular fluctuation of longer period and smaller amplitude is indicated. (Author)

AD-258 976 Div. 8, 30
(6 July 61) OTS price $22.25

Armour Research Foundation, Chicago, Ill.
ELECTRON TUBE VIBRATION TEST PROCEDURES,
by M. E. Goldberg, D. F. Simonaitis, and others.
Final rept. 23 Jan 56-28 May 60. 30 Sep 60, 1v. incl. illus. tables, 16 refs.
(Contract AF 33(600)31879)
Unclassified report

DESCRIPTORS: *Electron tubes, Instrumentation, Test methods, *Noise (Radio), Noise (Radar), Test sets, Standardization, Measurement, Deterioration, Statistical analysis, Voltage, Tests, Test equipment, Vibration, Radiofrequency, *Test facilities.

An intensive investigation was made of vibration test procedures applied to certain tube types. Effort was divided into 3 tasks. Task A was concerned with fatigue tests of the tube types. Correlation studies were made of fatigue effects produced by the 96-hr fatigue test and the 3-hr fatigue test. The extent of tube degradation was evaluated in terms of measurement of tube parameters and measurement of tube noise during subjection to a standard vibration measurements test. Task B considered evaluation vibration measurements test for the purpose of establishing a standard test. Three vibration tests were compared, 2 at fixed frequency, fixed acceleration level. Maximum tube noise was the data of the test. Test reproducibility for fixed frequency test conditions lead to the conclusion that only limited correlation could be obtained from different tests or, in fact, repetition of the same test. In Task C, factors affecting tube noise were studied in detail. Swept sinusoidal tests and random excitation tests (constant special density and equal energy per octave) were studied. (Author)

9. FLUID MECHANICS

AD-258 425 Div. 9, 25
(23 June 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
ON THE TRANSLATORY WHIRL MOTION OF A VERTICAL ROTOR IN PLAIN CYLINDRICAL GAS-DYNAMIC JOURNAL BEARINGS,
by C. H. T. Pan and B. Sternlicht. Technical rept. 8 May 61, 14p. incl. illus.
(Contract Nonr-284400, Proj. NR 097-348)
Unclassified report

DESCRIPTORS: Bearings, *Journal bearings, *Gas bearings, Rotation, *Lubrication, Gases, Gas flow, Fluid mechanics.

The determination of the bearing fluid film forces in a rotor system under dynamical conditions is discussed. In the case of a vertical rotor operating in a gaseous medium in plain cylindrical journal bearings, the steady whirl approximation is appropriate. In the steady whirl approximation, a set of rotating coordinates is employed, and the time dependence of the Reynolds equation is eliminated. At the same time, the compressibility number, Lambda, is replaced by the quantity (1-2 alpha/omega) multiplied by lambda. This approximation applies when both whirl acceleration and the radial velocity of the shaft are small. The attitude angle of the fluid film force is strongly dependent on the whirl motion. Experimental data of synchronous whirl agrees with the theoretical calculations based on the steady whirl analysis. A perfectly balanced vertical rotor in a plain gas dynamic journal bearing is always unstable with respect to the half frequency whirl.

AD-258 433 Div. 9
(22 June 61) OTS price $26.00

Israel Inst. of Tech., Haifa.
RESEARCH ON CROSS STRESSES IN THE FLOW OF RAREFIED AIR,
by Markus Reiner. Technical report. 1 Mar 61, 1v. incl. illus. tables.
(Contract AF 61(052)223; Continuation of Contract AF 61-(052)10)
(AFOSR-44)
Unclassified report

DESCRIPTORS: *Fluid flow, *Air, *Shear stresses, Gases, Kinetic theory, Elasticity, Stresses.

This report includes:
CROSS-STRESSES IN THE FLOW OF RAREFIED AIR, by A. Feux and M. Reiner. 1 Mar 61, 1v. incl. illus. tables.

SECOND-ORDER EFFECTS IN THE TORSIONAL FLOW OF A GAS IN ACCORDANCE WITH THE KINETIC THEORY, by M. Bentwich and M. Reiner. Mar 61, 8p.

CROSS-STRESSES IN THE LAMINAR FLOW OF GASES IN ACCORDANCE WITH MAXWELL'S DYNAMICAL THEORY, by M. Reiner. Mar 61, 15p. illus.

THE STRESS-STRAIN-RELATION OF ELASTICITY AND THE MEASURE OF STRAIN, by M. Reiner. 11 Feb 59, 6p. (Reprint from Zeitschrift fur Angewandte Mathematik und Mechanik 40:415-420, Sep 60)

MEASURES OF DEFORMATION IN THE STRAINED AND IN THE UNSTRAINED STATE, by Z. Kerni and M. Reiner. 1960, 4p. (Reprint from Bull. of the Research Council of Israel 8C:89-92, Oct 60)

The cross stresses effect discovered by Reiner in the laminar flow of air at atmospheric pressure was investigated at 2/3 and 1/3 ambient air pressure. It was found that the effect decreases with decreasing ambient pressure. At higher rates of flow an instability sets in and a Taylor-Saffman effect (J. Aeronaut. Sci. 24:553, 1957) is developed which increases with decreasing ambient pressure. (Author)

AD-258 436 Div. 9
(26 June 61) OTS price $5.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AN INVESTIGATION OF LAMINAR HEAT TRANSFER TO SLENDER CONES IN THE HYPERSONIC SHOCK TUNNEL,
by Charles E. Wittliff and Merle R. Wilson. May 61, 60p. incl. illus. tables (Rept. no. AF-1270-A-2)
(Contract AF 33(616)6025, Proj. 7064)
(WADD TN 59-6) Unclassified report

DESCRIPTORS: *Heat transfer, *Conical bodies, *Hypersonic flow, Hypersonic wind tunnels, Yaw, Laminar boundary layer, Hypervelocity vehicles.

An investigation of laminar heat transfer to slender yawed cones was conducted in the CAL 11- by 15-in. shock tunnel at Mach numbers from 11 to 13 and at yaw angles up to 14 degrees. Both sharp and blunt-nose cones having a 5-degree half angle were tested. The heat-transfer rates are compared with theoretical predictions. The effects on the local heat-transfer rates of the boundary-layer displacement thickness, transverse curvature, yaw, nose bluntness, and the entropy sublayer are discussed. At zero yaw, the experimental data for the sharp cone are in good agreement with theory when boundary-layer displacement and transverse-curvature effects are included. At larger than 3 degree yaw angles, the experimental heat transfer was found to be greater than that predicted theoretically. However, at these yaw angles the heat-transfer distribution on the windward side was in good agreement with laminar boundary-layer calculations based on an assumption of local similarity. (Author)

AD-258 442 Div. 9, 2
(26 June 61) OTS price $2.60

Wave Research Lab., U. of Calif., Berkeley.
EXPERIMENTAL STUDY ON THE SOLITARY WAVE REFLECTION ALONG A STRAIGHT SLOPED WALL AT OBLIQUE ANGLE OF INCIDENCE,
by T. C. Chen. Aug 60, Rev. Mar 61, 29p. incl. illus. tables (Supersedes AD-245 038)
(Contract DA 49-055-eng-44)
(Beach Erosion Board Technical Memo. no. 124)
Unclassified report

DESCRIPTORS: *Water waves, Reflection, Wave analysis, Wave transmission, Levees, *Hydrodynamics, Model basins, Test facilities.

The reflection pattern of a solitary wave impinging on a sloping wall and some accompanying phenomena were studied in a laboratory ripple tank. The angle of incidence of the wave varied between zero and 90 degrees and the slope angle of the wall with the horizontal, between 20 and 150 degrees. It was found that curved ripples developed when incident waves hit a wall of slope less than 65 degrees approximately. As the angle incidence increased, an envelope of these ripples formed and became large enough beyond a certain angle of incidence, depending on slope, to look like a reflected wave but remained curved as were the ripples. For a relatively steep wall slope, larger than 65 degrees, reflection was regular, but the angle of incidence at which a straight reflected wave occurred depended on the slope of the wall. For a wall with negative slope Mach reflection took place for wave incident angles between 30 and 35 degrees. Mach reflection ceased and regular reflection occurred hen the angle of incidence was 45 degrees. Three types of wave behavior relative to breaking were observed and found to be related to the angle of incidence. (Author)

AD-258 606 Div. 9, 15, 25
(30 June 61) OTS price $4.60

Western Reserve U., Cleveland, Ohio.
ON THE SIGNIFICANCE OF LIN'S VELOCITY CONSTRAINT IN TWO-FLUID HYDRODYNAMICS,
by R. T. Whitlock. Interim rept. 26 May 61, 46p. (Technical rept. no. 2)
(Contract DA 33-019-ORD-3003, Proj. 2430)
(AROD rept. no. 2430:2) Unclassified report

DESCRIPTORS: *Helium, *Liquefied gases, *Hydrodynamics, Vortices, Entropy, Mathematical analysis, Partial differential equations, Velocity.

An attempt is made to clarify the inclusion of Lin's velocity constraint in the Eckart-Zilsel-Lin variational principle as applied to the two-fluid model of liquid He II. The significance of the velocity constraint is illustrated by means of a simple one-particle example and by applying the variational formulation to a single ideal fluid. By showing that the Euler equations of the variational principle are essentially the equations of the Weber transformation in classical hydrodynamics, it is proved that every possible flow of an ideal fluid is an extremal of the variational principle only if Lin's constraint is included. What form the constraint should take in two-fluid hydrodynamics appears to be somewhat arbitrary. If only the center-of-mass velocity is constrained, which is equivalent to Lin's treatment, the effect is to require that the bulk liquid be irrotational at some instant in order that the superfluid can remain irrotational. If a Lin-type constraint is imposed on the normal-fluid velocity, but no similar constraint is placed on the super-fluid velocity, it is shown that Zilsel's result, curl Vs equals 0 is obtained. The resulting equations of motion for both components are identical to those of Zilsel. (Author)

AD-258 675 Div. 9
(28 June 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
THE EFFECTS OF THE MOLECULAR PROPERTIES OF AN INJECTED GAS ON COMPRESSIBLE AIR LAMINAR BOUNDARY LAYER SKIN FRICTION AND HEAT TRANSFER,
by I. Korobkin. 30 Mar 61, 11p. illus. table (Aeroballistic research rept. no. 145)
(NAVWEPS rept. no. 7410) Unclassified report

DESCRIPTORS: *Laminar boundary layer, Compressed air, Injection, *Heat transfer, *Airframes, *Aerodynamic heating, Molecules, *Sheets, Guided missiles, Jet mixing flow, Molecular weight, Specific heat, Transport properties, Viscosity, Thermal conductivity, Helium, Methanes, Air, Gases, Carbon tetrachloride.

A theoretical study has been made on the effects of the molecular properties of a gas injected into the compressible air laminar boundary layer on a flat plate. A simple rigid sphere model was used for describing the transport properties of viscosity, thermal conductivity, and diffusion coefficient, requiring knowledge only of molecular weight and molecular or collision diameter. The specific heat was computed from the equipartition of energy. The analysis demonstrated that small molecular weight and large molecular diameter were desirable for the reduction of skin friction and heat transfer. Furthermore, large specific heat per unit mass reduced heat transfer but had little effect on skin friction. Large specific heat on a unit mass basis may result from either low molecular weight as in

the case of helium or high molar specific heat as in the case of polyatomic gases which have many internal degrees of freedom. The combination of large molecular diameter and large molar specific heat associated with a polyatomic gas may be more significant in reducing skin friction and heat transfer than the low molecular weight of a monatomic gas like helium. (Author)

AD-258 750 Div. 9, 25
(29 June 61) OTS price $8.10

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
STABILITY AND TRANSITION OF THE FREE-CONVECTION LAYER ALONG A VERTICAL FLAT PLATE,
by Albin A. Szewczyk. May 61, 82p. incl. illus. tables (Technical note no. BN-247)
(Contract AF 49(638)645)
(AFOSR-765) Unclassified report

DESCRIPTORS: *Fluid flow, *Boundary layer, Sheets, Laminar boundary layer, Turbulent flow, Perturbation theory, Partial differential equations, Experimental data, Vortices, Stability, Differential equations, Liquids.

The free-convection layer along a vertical flat plate is investigated theoretically as well as experimentally with a view to studying its instability and natural transition from laminar to turbulent flow. Stability calculations are carried out based upon the small perturbation theory for the exact velocity profile for the Prandtl number 10. Temperature profiles are measured along a vertical electrically-heated brass plate. By the use of a dye technique the natural transition mechanism is investigated, i.e., discrete vortex lines and their subsequent distortion into three-dimensional pattern and eventual breakdown is carefully studied. In addition a double-row vortex system, which arises in the free-convection layer, is investigated. Its mechanics and over-all effect on the stability and transition of the free-convection layer are discussed. (Author)

AD-258 780 Div. 9, 1
(29 June 61) OTS price $3.60

Vehicle Research Corp., Pasadena, Calif.
PERFORMANCE THEORY FOR HIGH SPEED GROUND EFFECT MACHINES,
by T. Strand, W. W. Royce, and T. Fujita. 1 June 61, 1v. incl. illus. (Rept. no. 11)
(Contract Nonr-320700)
Unclassified report

DESCRIPTORS: *Flying platforms, *Ground effect, Jets, Jet pumps, Fluid mechanics, *Aerodynamics, Lift, Drag, Stability, Airfoils.

The cruise flight of vehicles of rectangular planform employing an air pressure seal between the ground and the vehicle along the two streamwise sides is considered. The variation of the optimum rearward deflection angle of the side jet pressure seal with speed for minimum over-all power expenditure and maximum range is found. It is concluded that a mixed propulsion system (jet deflection plus propeller(s)) is required. Volume flow and the corresponding fan pressure rise needed are also calculated. The maximum lift/drag ratio is determined. The maximum thickness ratios of the vehicles are considered to be large compared to the ground height/vehicle length ratio. Two-dimensional airfoil theory is employed to show that close to stagnation conditions exist below the vehicles. The lower surface lift, pitching moment, and aerodynamic center location are determined. The flow over the upper surface is identified with flow over mounds. Upper surface lift coefficients are determined for typical mound shapes. High total lift coefficients are theoretically obtainable with almost zero induced drag. The conventional induced drag power penalty is replaced by a sealing air power expenditure. (Author)

AD-258 786 Div. 9, 25
(29 June 61) OTS price $10.10

Flight Sciences Lab., Inc., Buffalo, N. Y.
SIMILARITY STUDIES FOR DISSOCIATING GASES IN HYPERSONIC, LOW DENSITY FLOW,
by K. Pearce, S. Samet, and R. J. Whalen. Rept. for May 59-Feb 60 on Experimental Simulation of Flight Mechanics. Sep 60, 112p. incl. illus. tables, 50 refs.
(Contract AF 33(616)6482, Proj. 1426)
(WADD TR 60-341) Unclassified report

DESCRIPTORS: *Gas flow, Superaerodynamics, *Hypersonics, *Dissociation, Fluid mechanics, Hypervelocity vehicles, Thermodynamics, Shock waves, Re-entry vehicles, Density, Gases, Chemical reactions, Chemical equilibrium.

Contents:
Viscous and inviscid hypersonic similitude for an equilibrium dissociating gas
  Inviscid hypersonic similitude
  Viscous hypersonic similitude
  Experimental and numerical verification of viscous and inviscid hypersonic similitude
  Simulation requirements in the flight spectrum associated with hypersonic velocity vehicles
  Spark-heated and shock tunnel simulation capability
Hypersonic nonequilibrium gas flows
  The presence and influence of dissociation
  Nonequilibrium in hypersonic nozzle flow
  Hypersonic nonequilibrium gas flows about arbitrary shapes
  The approach to equilibrium behind a normal shock wave
Rarefied gas flows
  Hypersonic gas flows at low Reynolds number
  Free molecular flows

AD-258 805 Div. 9
(29 June 61) OTS price $16.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ANALOGY METHODS IN AEROHYDRODYNAMICS (Metody Analogiy V. Aerogidrodinamike),
by N. N. Suntsov. 8 Feb 61, 238p. incl. illus. tables (Trans. no. MCL-278 pt. 1 from the publishing house, Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury, Moscow, 324p. 1958)
Unclassified report

DESCRIPTORS: *Hydrodynamics, *Aerodynamics, *Magnetohydrodynamics, Analog computers, Model tests, Textbooks, Magnetic fields, *Magnetism, *Electricity, Electrical networks, Electrolytic cells, *Fluid flow, Shock waves, Hydraulic systems, *Gases, Fluids, Liquids.

This book gives an account of analog methods applicable to the solution of problems in aerohydrodynamics. The first chapter covers general information on analog methods and a short history of their development and application. The second

chapter cites the basic equations of aerohydrodynamics to the degree necessary for the introduction of further material. The third, fourth, and fifth chapters are devoted to the exposition of the methods of the electrohydrodynamic, magnetohydrodynamic, and gas-hydraulic analogies respectively. (Author)

AD-258 806 Div. 9
(29 June 61) OTS price $11.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ANALOGY METHODS IN AEROHYDRODYNAMICS,
by N. N. Suntsov. 8 Feb 61, 1v. incl. illus. tables (Trans. no. MCL-278, pt. 2, of Metody Analogiy v Aerogidrodinamike, AD-258 805)
Unclassified report

DESCRIPTORS: *Hydrodynamics, *Aerodynamics, *Magnetohydrodynamics, *Magnetism, *Electricity, *Fluid flow, *Gases, Analog computers, Model tests, Textbooks, Magnetic fields, Electrical networks, Electrolytic cells, Shock waves, Fluids, Liquids, Hydraulic systems.

Contents:
The magnetohydrodynamic analogy (continuation from AD-258 805)
The gas-hydraulic analogy

AD-258 859 Div. 9, 24
(30 June 61) OTS price $1.10

Convair, San Diego, Calif.
EXPERIMENTAL STUDY OF HYPERSONIC TURBULENT WAKES,
by T. A. Dana and W. W. Short. 29 May 61, 5p. incl. illus. (Rept. no. ZPh-103)
(Contract DA 04-495-ORD-3112)
Unclassified report

DESCRIPTORS: Wake, *Hypersonics, Spheres, *Hypervelocity projectiles, Pellets, Aluminum, *Turbulent flow, Photographic analysis, *Spark shadowgraph photography.

Shadowgraph pictures were obtained of wakes behind 0.3125-in. diam. spheres traveling at 7400 ft/sec. The rate of growth of the turbulent core in the wake was measured up to 250 diameters behind the spheres. The results of the data indicated the turbulent core grows as the 2/3 power of downstream distance in the region from 30 to 100 diameters behind the sphere and as the 1/3 power between 100 and 250 diameters. (Author)

AD-258 962 Div. 9
(30 June 61) OTS price $5.60

Syracuse U. Research Inst., N. Y.
THE SAMPLING OF AEROSOLS IN A TURBULENT AIR FLOW,
by V. Goldschmidt. Progress rept. no. 4, 1 Mar-31 May 61. 31 May 61, 1v. incl. illus. tables, 27 refs.
(Contract DA 18-108-405-cml-794)
Unclassified report

DESCRIPTORS: *Aerosol generators, Sampling, *Aerosols, Wind tunnels, *Turbulent flow, Anemometers, Distribution, Temperature, Physical properties, Boilers, Microscopes, Analysis.

AD-258 966 Div. 9
(3 July 61) OTS price $7.60

Institute of Aerophysics, U. of Toronto (Canada).
A STATE-OF-THE-ART SURVEY OF SOME ASPECTS OF THE AERODYNAMICS OF HIGHLY RAREFIED GASES,
by G. N. Patterson. Interim rept. no. 1. Mar 61, 74p. incl. illus. 22 refs. (UTIA review no. 18)
(Contract AF 33(616)6990)
(ARL-39)
Unclassified report

DESCRIPTORS: *Superaerodynamics, Aerodynamics, *Rare gases, Gases, Interstellar matter, Mathematical analysis, Partial differential equations, Molecules, Molecular beams, Transport properties, *Gas flow, Kinetic theory.

A state-of-the-art survey is given of the mechanics of rarefied gases: properties of molecules and their motion, distribution function, molecular scattering, properties of molecular collisions, Boltzmann equation, Maxwell transfer equations, transfer properties of a gas in molecular equilibrium, Boltzmann equation for free molecule flow, reflection phenomena, free molecule aerodynamics, molecular beams, Boltzmann relation as an integral equation, kinetic model of the Boltzmann equation, and basic equations for an isolated body in near-free-molecule flow. (Author)

AD-258 967 Div. 9
(3 July 61) OTS price $8.10

Institute of Aerophysics, U. of Toronto (Canada).
DRAG MEASUREMENTS ON CIRCULAR CYLINDERS AND SPHERES IN THE TRANSITION REGIME AT A MACH NUMBER OF 2,
by A. K. Sreekanth. Apr 61, 1v. incl. illus. tables (UTIA rept. no. 74)
(Contract AF 33(616)6990)
(ARL-53)
Unclassified report

DESCRIPTORS: *Supersonic flow, *Drag, Cylindrical bodies, Spheres, Supersonic wind tunnels, Model tests, *Superaerodynamics, Tables, Measurement, Integral equations, Functions.

Measurements were obtained in the low density wind tunnel. The mean free path of the air in the test flow was 0.049 in. and the model sizes were such that Knudsen numbers in the range 0.2 to 6 for the cylinders and 0.1 to 0.8 for the spheres were covered. The drag coefficient of circular cylinders calculated from the measured forces increased with increasing Knudsen number and reached a value of 3.02 at Kn equals 3. In contrast, the theoretical value for free molecule flow conditions is 3.7 if completely diffuse reflection and complete temperature accommodation are assumed and 3.35 if complete specular reflection occurs. This shows that at a Knudsen number of approximately 5 the drag coefficient is still significantly lower than the free molecule flow value. The experimental results on sphere drag in the same flow indicate that the theory and experiment are essentially in agreement. It is suggested that the discrepancy between the theoretical and measured values for the case of circular cylinders is associated with the fact that in this case not all dimensions are smaller than the mean free path. It was concluded that the validity of the conventional assumption that the free molecule flow conditions should be applicable at a Knudsen number of approximately 5 is in doubt for the case of cylinders transverse to the flow. (Author)

AD-259 048 Div. 9, 1
(6 July 61) OTS price $4.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
OSR-SPONSORED STUDIES ON UNSTEADY AERODYNAMIC AND NONLINEAR STRUCTURAL PROBLEMS OF AIRCRAFT AT MIT, 1957-1960,
by Holt Ashley and T. H. H. Pian. Apr 61, 39p. incl. illus. 35 refs. (Rept. no. 61-4; ASRL rept. no. 76-6)
(Contract AF 49(638)160; In cooperation with Aerolastic and Structures Research Lab.)
(AFOSR-588) Unclassified report

DESCRIPTORS: *Aerodynamics, *Supersonics, Shock waves, Blunt bodies, Oscillation, Hypersonics, Gas ionization, Mathematical analysis, *Transonics, Load distribution, Combustion, Boundary layer, Gas flow, Radiation effects, Deformation, Thermal stresses, *Elasticity, Elastic shells, Sandwich panels, Beams, Dynamics, Shear stresses, Structures, Airframes.

The principal areas of effort presented under the aerodynamic phase are the following: the shock layer adjacent to an oscillating blunt nose in a hypersonic airstream; Prandtl-Meyer expansions in dissociational equilibrium; unsteady transonic airloads in the presence of a strong shock; the stability of combustion zones; the boundary-layer under conditions of time-dependent external flow; and radiation effects in hypersonic flow of real gases. The principal topics treated under the structural phase are the following: large deflections of curved strips and plates under thermal and pressure loadings; deflection and snap buckling of shallow spherical shells; yield conditions of plates and shells under combined bending moments and membrane stresses; inelastic diffusions of stiffened panels; dynamic response of rigid-plastic curved beams; dynamic buckling of shallow spherical shells; straight-crested waves in plates; and finite deflections of shallow arches taking shear deformation into consideration. (Author)

AD-259 049 Div. 9, 25
(6 July 61) OTS price $6.60

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
A MONTE CARLO SOLUTION FOR HEAT TRANSFER IN RAREFIED GASES,
by Milton L. Lavin. May 61, 151p. incl. illus. (Rept. no. 61-3)
(Contracts AF 49(638)297 and AF 19(604)5698)
(AFOSR-627) Unclassified report

DESCRIPTORS: *Numerical methods and procedures, *Heat transfer, *Kinetic theory, Gas flow, *Superaerodynamics, Fluid mechanics, Statistical analysis, Non-linear systems, Molecules, Shock waves.

The nonlinear heat transfer problem in the transition regime between free molecule and continuum flow is solved by an iterative Monte Carlo method, and the results are compared with both linear and nonlinear analytical solutions. The statistical procedure consists of constructing an improved distribution function by recording the history of a single test molecule which wanders through a phase space populated by molecules of the previous iterate. Molecular wanderings are determined by selecting events at random from the probability distributions that govern the interaction process. For a nominal Knudsen number of 2.0 and a temperature ratio of 4:1, the Monte Carlo results differ from both the linear and nonlinear analytical solutions by no more than 10-15%. Moreover, these statistical results seem to substantiate Mott-Smith's prediction of a Knudsen layer adjacent to the boundary. (Author)

10. FUELS AND COMBUSTION

AD-258 390 Div. 10
(29 June 61) OTS price $4.60

AeroChem Research Labs., Inc., Princeton, N. J.
ADDITIVE EFFECTS IN SOLID PROPELLANT BURNING,
by H. Silla, H. Burwasser, and H. F. Calcote. Final rept. May 60, 37p. incl. illus. tables, 12 refs. (Technical publication no. 18; Supersedes Technical memo. no. 14, AD-225 004, Technical memo. no. 14, and Technical memo. no. 20, AD-236 243)
(Contract Nonr-280600)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Fuel additives, *Combustion, Rocket oxidizers, Oxygen, Ammonium radicals, Perchlorates, Polymers, Styrenes, Esters, Perchloryl radicals, Fluorides, Atmosphere, Nitrogen.

An experimental program was conducted to determine the effect of additives on the burning rates of ammonium perchlorate-polyesterpolystyrene solid propellant strands at 1 atm and below. The object of this was to learn more about the mechanism of solid propellant burning. Additives were incorporated either by adding them to the gas in which the propellant burned or by admixing them with the solid. Admixture with the solid produced burning rates for 0.025 to 0.049 in/sec while the rate without additive was 0.031 in/sec. Burning the propellant in an O atmosphere produced a tenfold increase in burning rate over burning it in N. Other oxidizers, e.g., C103F, caused a similar increase while H and He had no effect. The O is effective for stoichiometric propellants, and controlling the O flow controls the burning rate. The results are interpreted as showing that the fuel-oxidizer reactions in the gas phase of a burning propellant do not normally involve O which may even act as a catalyst. Burning rates in N atmospheres have a linear pressure dependence from 50 to 760 mm Hg. A comparison was made of these data with the Summerfield burning rate equation. A careful analysis of experimental errors was made with particular attention to the increase in burning rate due to a tilted burning surface. (Author)

AD-258 410 Div. 10, 25
(26 June 61) OTS price $2.60

Aeronutronic, Newport Beach, Calif.
AN EXPERIMENTAL PROGRAM FOR OBTAINING THE THERMODYNAMIC PROPERTIES OF PROPELLANT COMBUSTION PRODUCTS,
by D. L. Hildenbrand and L. P. Theard. Final rept. 15 June 61, 32p. incl. tables, 16 refs. (Publication no. U-1274)
(Contract NOrd-17980)
Unclassified report

DESCRIPTORS: *Rocket propellants, Thermodynamics, Combustion, *Combustion chamber gases, Zirconium compounds, Fluorides, Vaporization, Vapor pressure, Vapors, Aluminum compounds, Lithium compounds, Nitrides, Dissociation, Magnesium compounds, Boron compounds, Tantalum, Platinum, Mass spectroscopy, Evapotranspiration, Heat of formation.

Torsion-effusion studies of the vaporization of ZrF_4 were completed. The results yield a condensation coefficient of about 0.08 and a heat of sublimation of 55.8 kcal/mole at 298 K. The heat of formation of $ZrF_4(g)$ at 298 K was derived as -401.1 ± 3 kcal/mole. Studies of the vaporization of ZrF_4 in the presence of finely divided Zr indicate that lower fluorides are not formed under these conditions. The vapor pressures of AlF_3 and a 1:1 mole ratio mixture of Li and Al fluorides were measured by the torsion-effusion method. A heat of sublimation at 298 K of 71.0 ± 0.5 kcal/mole was obtained for AlF_3, from which the heat of formation of $AlF_3(g)$ at 298 K was derived as -285.3 ± 2 kcal/mole. The heat of formation of $LiAlF_4$ at 298 K was derived as -447 ± 7 kcal/mole. Measurements of the dissociation pressure of AlN are in progress. The vaporization of Mg_3N_2 was studied from 1100 to 1260 K by the torsion method. A condensation coefficient of about 0.005 was indicated. (Author)

AD-258 435 Div. 10, 26
(26 June 61) OTS price $5.60

Propellex Chemical Div., Chromalloy Corp., Edwardsville, Ill.
DEVELOPMENT STUDY FOR IMPROVEMENT OF THE MANUFACTURING PROCESS FOR TRIETHYLENEGLYCOL-DINITRATE (TEGDN).
Final project rept. Mar-Dec 60, 15 June 61, 54p. incl. illus, tables, 15 refs.
(Contract DA 23-072-501-ORD-48)
Unclassified report

DESCRIPTORS: *Nitrates, Ethylenes, *Glycols, Manufacturing methods, *Plasticizers, Solid rocket propellants, Processing, Production, Industrial equipment, Industrial production, Nitration, Reaction kinetics.

Studies initiated to improve the manufacturing process of triethyleneglycoldinitrate (TEGDN), included a literature survey, chemical kinetic considerations, process variables such as temperature, concentration of reactants and reaction times, recovery of spent acid, and process economic considerations. General pilot plant equipment design and criteria for materials of construction are also to be established. A versatile nitration apparatus was designed and built for the study of the TEGDN reaction. The reactor consists of an interchangeable stainless steel beaker with a 1/4-in. pipe welded to the bottom. The reactor sets in a larger brine jacket which cools the reaction. Systems were explored with reactant concentrations close to those described by Auberstein (Chem. Abstr., 45:3531, 1951) as optimum for the production of TEGDN. A study was made of the spent acid stabilization and recovery from TEGDN reactions. A stabilization process was developed which resulted in a product which can be stored indefinitely at 60 to 80 F or heated for removal of the HNO_3 fraction in a recovery unit.

AD-258 519 Div. 10, 27
(27 June 61) OTS price $4.60

Free U. of Brussels (Belgium).
INTERNAL BURNING STAR AND WAGON-WHEEL DESIGNS FOR SOLID PROPELLANT GRAINS,
by Jean A. Vandenkerckhove. 1960, 13p. illus.
(Contract AF 61(052)58-13; In cooperation with Poudreries Reunies de Belgique)
Unclassified report

DESCRIPTORS: Design, *Solid rocket propellants, *Propellant grains, Mathematical analysis, Propellants, *Combustion, Combustion chambers, Propellant properties, Heating, Combustion chamber liners, Equations, Rocket propulsion, Rocket propellants.

A study of 2 families of grain geometries, the internal burning star and the internal burning wagon wheel, was made. These 2 designs were particularly useful because they give a wide range of suitable characteristics, while permitting the propellant itself to protect the chamber walls against heating. The characteristics of side-burning grains were analyzed in a cross-section perpendicular to the grain axis for each of the 2 designs, while the possibility of tapering the grain and the influence of the grain end surfaces were also considered. The geometries under consideration were presented as dimensionless to permit the maximum information in the minimum number of charts covering almost completely the useful range of the design parameters. (Author)

AD-258 679 Div. 10, 9
(5 July 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AN EXPERIMENTAL INVESTIGATION OF THE DAMPING OF LIQUID OSCILLATIONS IN AN OBLATE SPHEROIDAL TANK WITH AND WITHOUT BAFFLES,
by David G. Stephens, H. Wayne Leonard, and Milton A. Silveira. June 61, 23p. incl. illus.
(NASA Technical note D-808)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-808.

DESCRIPTORS: Oscillation, Fluid flow, Damping, *Fuel tanks, *Liquid rocket propellants, Guided missile research, Experimental data, Liquids.

An experimental investigation was conducted to determine the damping of the fundamental antisymmetric mode of oscillation of liquids contained in an oblate spheroidal tank. The decay of the fundamental mode was studied for a range of liquid depths in tanks with and without baffles. In the investigation of baffle effects, ring and cruciform baffles of various sizes were fixed at different locations within the tank. Data show the variation of the damping factor with tank fullness and with baffle type, width, location, and orientation as well as the effects of the amplitude of the liquid oscillations and of small variations in the liquid kinematic viscosity on the damping factor. Results indicate that the addition of ring baffles to the tank results in an increase in the available effective damping when the baffle plane is in a region near the equilibrium liquid surface, and that cruciform baffles are effective in the damping of the fundamental mode in the near-empty tank. No apparent changes in damping for the tanks having ring baffles were observed as the kinematic viscosity of the liquid was varied over a small range. (Author)

Division 11 - GROUND TRANSPORTATION EQUIPMENT

AD-258 777 Div. 10, 5, 12, 27
(29 June 61) OTS price $9.10

Stanford Research Inst., Menlo Park, Calif.
STUDY OF RADAR BEAM ATTENUATION IN ROCKET EXHAUST GASES. PART 2. THE CHEMISTRY OF IONIZATION IN ROCKET EXHAUSTS,
by Carole R. Gatz, Willis A. Rosser, and Felix T. Smith. Final rept. Feb 61, 96p. incl. illus. tables, 57 refs.
(Contract AF 04(647)221)
(AFBMD TR 61-39, pt. 2) Unclassified report

DESCRIPTORS: *Rocket motors, *Exhaust gases, *Radar signals, Radar reflections, *Electromagnetic waves, Microwaves, Guided missiles, Telemetering, Ionization, Attenuation, Electrons, Guidance, Reaction kinetics, Plasma physics, Gas ionization, *Solid rocket propellants, Aluminum compounds, Oxides, *Flames, Mass spectroscopy, Nitrogen, Hydrogen, Cesium, Mathematical analysis.

Application of the theory of ionization of solid particles to some measurements on alumina-bearing flames shows that the effective work function of alumina is less than 6.1 ev. Consequences for rocket exhaust ionization are pointed out, and a theory of kinetics of particle ionization is initiated. The mathematical theory of gaseous ionization-recombination kinetics in an expanding nozzle is generalized and extended. Laboratory experiments conducted on rates and mechanisms of electron production and removal included: (1) kinetic study of chemionization reactions; (2) measurements of flame conductivity to determine electron concentration, the effect of halogen flame inhibitors, and the effect of microwave radiation on electron temperature; and (3) application of Langmuir probes to low-pressure flames. (Author)

AD-258 807 Div. 10, 27
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW TYPES OF FUEL FOR ROCKET ENGINES,
by V. Parfenov. 16 Mar 61, 5p. incl. illus.
(Trans. no. MCL-419 of Sovetskaya Aviatsiya 233: p. 2, 2 Oct 57)
Unclassified report

DESCRIPTORS: *Rocket fuels, Rocket motors, Metals, Powder metals, Metallic compounds, Free radicals, Fuel elements, Rocket propulsion, Fuels, USSR, Materials, Beryllium, Boron, Boron compounds, Hydrides, Pentaboranes.

AD-258 883 Div. 10
(3 July 61) OTS price $9.10

Aerojet-General Corp., Sacramento, Calif.
STUDY OF MECHANICAL PROPERTIES OF SOLID ROCKET PROPELLANT,
by James H. Wiegand. Quarterly rept. no. 1, 30 Jan-30 Apr 61. 30 May 61, 92p. incl. illus. tables, 15 refs. (Rept. no. 0411-10Q-1)
(Contract AF 33(600)40314)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, Tests, Mechanical properties, Stresses, Analysis, Mathematical analysis, Theory, Polymers, Urethanes, Determination, Failure (Mechanics), Design, Measurement, Photoelastic material.

A program of study was initiated to develop methods for optimum grain design. The first phase, concerned improvements in measurement technique leading to better assessment of the binder-oxidizer interaction under the multiaxial conditions expected in motors. The second phase, concerned the classification of behavior into several classes characterized by the degree of localization of dewetting with resultant localization of failure. The third phase, was concerned with the suitability of infinitesimal linear theory in predicting stresses and strains; reasonable agreement is found up to strains of the order of 10% above which significant dewetting and dilatation occur. The fourth phase, was concerned with the variability of failure behavior and a definite ordering of batches from good to bad appears to be effected by low rate tensile tests at different temperatures or by comparing low rate uniaxial elongations at failure with cracking in small tubular, case-bonded grains. The fifth phase, dealt with selection of a basic point of view; the Program Evaluation Research Task (PERT) system of network analysis appears to offer a suitable basis for study. (Author)

AD-258 885 Div. 10, 27
(3 July 61) OTS price $4.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
A STUDY OF PENTABORANE,
by Andreas V. Jensen and Berge B. Goshgarian. May 61, 40p. incl. illus. 32 refs. (Rept. no. AFFTC TR 61-34)
Unclassified report

DESCRIPTORS: *Pentaboranes, Boron compounds, Hydrides, Density, Vapor pressure, Freezing, Physical properties, Thermodynamics, Molecular structure, Stability, Handling, Toxicity, Colorimetric analysis, Decontamination, Detection, Rocket motors, Organic solvents, Storage, Solvent action, Chemical analysis, Synthesis, *Liquid rocket propellants, Test equipment, Test methods.

The density, vapor pressure, and freezing point of pentaborane -9 may all be determined in the quality control laboratory with one basic transfer apparatus and test vessels of 1-5 milliliter volume. These physical properties plus a determination of dissolved and total solids are sufficient to certify that the pentaborane is suitable for use in a rocket engine. The best method found to decontaminate entire missile systems after use with pentaborane is to flush with a hydrocarbon solvent such as a kerosene to remove most of the material, followed by a flush with a mixture containing 80% methylene chloride and 20% ethyl alcohol and purge dry with gaseous nitrogen. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-258 645 Div. 11
(28 June 61) OTS price $1.60

Convair, San Diego, Calif.
PRELIMINARY SPECIFICATION FOR DETAILED DESIGN OF GENERAL DYNAMICS/CONVAIR AIRCRAFT CARGO LOADING TRAILER (PROTOTYPE),
by P. A. Beck. 9 June 61, 16p. (Rept. no. ZM-657)
(Sponsored by Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.)
Unclassified report

DESCRIPTORS: Specifications, Design, *Trailers, Cargo vehicles, Loading, Aircraft, Hydraulic systems.

The design and testing of an adjustable height cargo loading trailer designated Aircraft Cargo Loading Trailer was undertaken. This trailer will be utilized at air terminals to transport palletized cargo between cargo aircraft and to and from storage areas and to transfer such cargo at both locations. Items handled will consist mainly of loaded 463L and Aerial delivery pallets. In the aircraft loading and unloading operation, the trailer will be towed to the aircraft site and backed into alignment with the aft aircraft cargo opening with the large pallet platform elevated to aircraft floor level. A continuous pallet supporting surface will then be formed between the aircraft 463L pallet handling system and conveyors on the vehicle by means of a bridge which spans the distance between aircraft and trailer. (Author)

12. GUIDED MISSILES

AD-258 362 Div. 12
(22 June 61) OTS price $2.60

Army Missile Test Center, White Sands Missile Range, N. Mex.
NIKE-HERCULES. STEADY-STATE ACCELERATION TESTS. NIKE-HERCULES HPU,
by G. A. Adams. June 61, 20p. incl. illus. tables. (Technical memo. no. 866)
(Proj. TU1-3070)

Unclassified report

DESCRIPTORS: *Guided missiles, Surface to air, Tests, Acceleration, *Hydraulic pressure pumps, Pumps.

A Nike-Hercules Hydraulic pumping unit SN 20 was subjected to steady-state acceleration levels up to 80g at ambient conditions. A rise in oil temperature to 200 F, and a slight deformation of the link rod assembly, were the only malfunctions of the test. (Author)

AD-258 453 Div. 12, 22
(21 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE MODERN ROCKET WEAPONS,
by V. Nikolayev. 20 Jan 61, 9p. incl. illus. (Trans. no. MCL-193 from Voennye Znaniya 9:27-28, 1958).

Unclassified report

DESCRIPTORS: *Scientific intelligence, *USSR, *Rockets, *Guided missiles, Rocket motors, Armaments, Warfare, Weapons, Ordnance, Surface to surface, Surface to air, Air to surface, Classification.

A brief explanation of the reactive engine and the rocket engine is followed by information relative to the USSR categories of rocket weapons, which are grouped into ground missiles and aircraft missiles. Ground missiles are divided into ballistic missiles and winged missiles. The ballistic types are tactical (short range), long range, and ICBM. The winged missiles for use against aerial targets are called antiaircraft guided missiles, and those for use against ground targets are the nonreturnable flying bomb and the pilotless interceptor aircraft which releases its rockets and return. This latter type can have the same range as long range ballistic rockets. The aircraft missiles are divided into rocket- or jet-propelled flying bombs, aerial-combat missiles, aircraft torpedoes, and guided bombs.

AD-258 497 Div. 12, 33
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SOVIET AVIATION (SELECTED ARTICLES).
21 Dec 61, 21p. incl. illus. (Trans. no. MCL-405 of Sovetskaya Aviatsiya: No. 218, 16 Sep 60 and No. 221, 19 Sep 60, p. 3)

Unclassified report

DESCRIPTORS: USSR, Technological intelligence, *Space probes, Spaceships, Optical tracking, *Lunar probes, Gravity, Upper atmosphere, Manned, *Re-entry vehicles, *Rockets, *Air transportation, *Space flight.

Contents:
Optical orientation device on the voyage to the Cosmos, by V. Arsent'yev
How the speed of the rocket was changed, by B. Maksimachev
Cosmic rocket planes of the future, by S. S. Ustinov
Problems of science and technology transport rockets, by G. Petrovskiy

AD-258 577 Div. 12, 22
(26 June 61) OTS price $4.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
HAZARD CLASSIFICATION OF M50 IGNITER FOR M58A2 ROCKET IN GAR ID/2A,
by Paul P. Jennens. Airmunitions test rept. May 61, 42p. incl. illus. (OOY TR 61-21)

Unclassified report

DESCRIPTORS: *Hazards, *Shipping, Containers, Explosion damage, *Detonation, Igniters, *Rocket motors, Fires, Heat, Combustion, *Storage, Boron compounds, Perchlorates, Potassium compounds, Tests, Test methods, *Rocket igniters, *Guided missiles, Air to air, *Ignition, Safety.

Tests were required to determine the hazard classifications for storage and shipment of M50 Igniters. Separate classifications were required for Quantity-Distance, Storage Compatibility, and ICC Shipping. A series of 6 detonation tests were conducted to determine if the igniter would detonate within its individual shipping container and if there would be propagation from one container to another. Also an open fire test was conducted to demonstrate any detonation possibilities. Only normal type ignition occurred in all 7 tests. The igniter shipping containers burst along a soldered joint from the pressure of the blasting cap and igniter. No measurable overpressures were recorded at a 5 ft distance. The time expended for the igniters in metal shipping containers (shipped 12 to a box) to cook-off in an open fire test ranged from 6 to 10 minutes. (Author)

Division 12 - GUIDED MISSILES

AD-258 578 Div. 12, 22
(26 June 61) OTS price $4.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
HAZARD CLASSIFICATION OF HYPERGOLIC IGNITER SM 65 (ATLAS),
by Joseph W. Holden. Airmunitions test rept. June 61, 35p. incl. illus. tables (OOY TR 61-27)
Unclassified report

DESCRIPTORS: *Hazards, *Rocket igniters, Safety, Detonation, Tests, Test methods, Accidents, Transportation, *Pyrophoric materials, Ethyl radicals, Aluminum compounds, Boron compounds, Explosion damage, Fires, Heat, Guided missiles, Surface to surface, *Shipping, Rocket motors, Liquid rocket propellants, Containers, *Storage, Combustion, Igniters.

Tests were made to obtain data which could be used to assign storage and ICC shipping classification to Air Force hypergolic igniters. The hypergolic ingiters were subjected to: one cook-off test, two detonation and propagation tests, and three drop tests. These igniters are a representative of hypergolic igniters used in the SM 65 (Atlas) Missile. A hypergolic igniter which accidentally functions either by rupturing a diaphragm or by a puncture while in the shipping container will ignite and burn the cardboard shipping box. Igniters in contact with or adjacent to the burning igniter will not ignite. In open air, propagation will not occur between hypergolic igniters; therefore blast damage will not occur. Damage, if any, will be from the heat on the ''O'' rings or igniter case. In a fire of intense heat the hypergolic igniter will burn. The igniter does not add to the fire. Cook-off time is difficult to determine since there is no visible change in the intensity of the fire. A hypergolic igniter cartridge removed from its metal shipping container and accidentally dropped from a height of more than 12 inches will cause the burst diaphragm to leak. (Author)

AD-258 659 Div. 12
(28 June 61) OTS price $8.10

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
PROCEEDINGS OF THE FIRST INTERNATIONAL SYMPOSIUM ON ANALYTICAL ASTRODYNAMICS JUNE 27-29 JUNE, 1961 AT THE UCLA CAMPUS, LOS ANGELES, CALIFORNIA.
1961, 1v.
(Contract AF 49(638)814; In cooperation with California U., Los Angeles)
(AFOSR-885) Unclassified report

DESCRIPTORS: *Astronautics, *Celestial mechanics, Orbital flight paths, Quantum mechanics, Satellite vehicle trajectories, *Satellite vehicle research, Space probes, Space navigation, Perturbation theory, Mathematical analysis, *Symposia.

AD-258 668 Div. 12
(28 June 61) OTS price $2.60

Massachusetts Inst. of Tech., Cambridge.
OPTIMUM SOFT LANDING TRAJECTORIES. PART I. ANALYSIS.
by Lawrence J. Berman. 30 Mar 61, 29p. incl. tables.
(Contract AF 49(638)363)
(AFOSR-519) Unclassified report

DESCRIPTORS: Orbital flight paths, Satellite vehicle trajectories, Calculus of variations, *Space flight, *Landing impact, Landing, Partial differential equations, Lunar probes.

A variational calculus solution is obtained for the thrust program for minimum propellant consumption to achieve landing of a rocket vehicle from a space orbit with zero relative velocity at touchdown, under the simplifying assumptions of no atmospheric forces and a uniform (i.e., flat-earth) gravitational field. These assumptions are appropriate for lunar landing of a moderately high thrust rocket. The results of the variational solution are interpreted to provide an appreciation of the physical nature of the requirements established by different initial conditions, as specified by initial altitude and velocity vector. Representing the initial conditions parametrically by an equivalent energy altitude and the actual altitude, five different regimes are identified and the corresponding thrust programs described. (Author)

AD-258 757 Div. 12, 25
(5 July 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
A PRELIMINARY STUDY OF THE ACOUSTIC TRANSMISSION LOSS OF TWO FIBERGLAS NOSE-CONE SHAPES,
by Vern G. Rollin. June 61, 36p. incl. illus. table (NASA Technical note D-852)
Unclassified report

Also available from NASA, Wash. 25, D. C., as Technical note D-852.

DESCRIPTORS: Acoustics, *Sound transmission, *Guided missile noses, *Rocket noses, *Glass textiles, Test equipment, Test methods, Tests, Noise, Conical bodies, Hemispherical shells, *Rocket motor noise, Turbulent boundary layer, Electronic systems.

An experimental acoustic survey was conducted inside two fiberglas missile nose cones in a simulated noise field at two intensities and two distances from the noise source. Data indicated an effect of geometric shape on spectral distribution and internal standing waves near the forward part of the nose cone. Empirical methods of computing transmission loss through the nose cone were unsatisfactory for determining sound levels within the nose cone. (Author)

AD-258 761 Div. 12
(29 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STUDY OF AN ACTIVE CONTROL SYSTEM FOR A SPINNING BODY,
by J. J. Adams. June 61, 30p. incl. illus. (NASA Technical note D-905)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-905.

DESCRIPTORS: *Control systems, *Spin, Analog computers, *Satellite attitude, *Satellite vehicles, Servomechanisms, *Stability, Gyroscopes, Damping, Manned, Extraterrestrial bases, Sun, Mathematical analysis, Design, *Aerodynamic configurations, Bodies of revolution.

The mission requirements for some satellites require that they spin continuously and at the same time maintain a precise direction of the spin

axis. An analog-computer study was made of an attitude control system which is suitable for such a satellite. The control system provides the necessary attitude control through the use of a spinning wheel, which will provide precession torques, commanded by an automatic closed-loop servomechanism system. The sensors used in the control loop are rate gyroscopes for damping of any wobble motion and a sun seeker for attitude control. The results of the study show that the controller can eliminate the wobble motion of the satellite resulting from a rectangular pulse moment disturbance and then return the spin axis to the reference space axis. The motion is damped to half amplitude in less than one cycle of the wobble motion. The controller can also reduce the motion resulting from a step change in product of inertia both by causing the new principal axis to be steadily alined with the spin vector and by reducing the cone angle generated by the reference body axis. These methods will reduce the motion whether the satellite is a disk, sphere, or rod configuration. (Author)

AD-258 762 Div. 12, 9, 14
(29 June 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATIONS OF THE DETERIORATION OF 22 REFRACTORY MATERIALS IN A MACH NUMBER 2 JET AT A STAGNATION TEMPERATURE OF 3,800 F,
by B. W. Lewis. June 61, 17p. incl. illus. table (NASA Technical note D-906)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-906.

DESCRIPTORS: *Refractory materials, *Deterioration, Jets, Supersonics, Titanium compounds, Tests, Test methods, Test equipment, *Reentry vehicles, *Cylindrical bodies, Silicon compounds, Carbides, *Guided missiles, Model tests, Rocket noses, *Aerodynamic heating, Nitrides, Borides, Aluminum compounds, Oxides, Metallic compounds, Chromium, Surfaces, *Ceramic materials, *High temperature research, Oxidation, Hemispherical shells, Hypervelocity vehicles.

A limited investigation of the deterioration characteristics of 22 refractory materials was conducted by exposing them to a stagnation temperature of 3,800 F in a Mach number 2 ceramic-heated jet. The materials tested were 6 materials whose major constituent was SiC, 5 cermets whose major constituent was TiC, 6 materials whose major constituents were metal borides, 4 cermets containing alumina, and 1 silicon nitride model. Tests consisted of obtaining weight change and appearance changes for 1/2-inch-diameter hemispherical-nose cylindrical models exposed to the air jet for 30 sec at a time for a total of 4 runs or 2 min. exposure. It was concluded that only those materials which changed in weight the least cound be recommended for further extensive application-oriented evaluations. The following materials fell in this category: SiC - Si, Cr - 28% alumina cermet, titanium boride - 5% B4C. The remainder of the materials tested had oxidation characteristics which appeared to be too severely limiting of their general applications to flight vehicles. (Author)

AD-258 837 Div. 12, 2, 16, 21
(29 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MAN, TECHNOLOGY AND SPACE,
by G. Pokrovskiy. 27 Mar 61, 14p. (Trans. no. MCL-851 of Ekonomicheskaya Gazeta 102 (774):pp. 3-4, 27 Sep 60).
Unclassified report

DESCRIPTORS: Man, *Space flight, Satellites, *USSR, Spaceships, Rockets, Rocket propulsion, Space navigation, Astronautics, Aviation medicine, Space medicine, Extraterrestrial bases.

AD-258 843 Div. 12
(29 June 61) OTS price $14.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BY ROCKET TO THE MOON,
by V. I. Levantovskiy. Apr 60, 1v. incl. illus. (Trans. no. MCL-879, pt. 2, pp. 237-443)
Unclassified report

DESCRIPTORS: Spaceships, Space capsules, *Astronautics, Extraterrestrial bases, Orbital flight paths, Satellite vehicle trajectories, *Space flight, Space probes, *Satellite vehicles, *Lunar probes, *Moon, Surfaces, Bibliography, USSR, Technological intelligence, Manned, *Satellite rendezvous vehicles, *Space navigation, Interstellar matter, Rocket propulsion, Sounding rockets, Artificial planetoids, Extraterrestrial geography, Solar systems, Planetary atmospheres, Exploration, Space environmental conditions.

Research is presented on projected travel to the moon and other planets. The following areas are covered: (1) Flight to the moon--plans and reality: technical feasibility of such an expedition, interplanetary stations, certain plans for expeditions, and flight of unmanned automatic rockets. (2) Investigation of the moon and outer space: matter in the universe; the relief, the physical conditions, and the methods of scientific investigations of the moon; and the moon as an intermediate station. (3) Interplanetary flights: interplanetary trajectories of pulsed rockets, the first artificial planets, trajectories of continuous-thrust rockets, role of man in space flight, use of sounding rockets, interplanetary expeditions, and conquering space. The second and third Soviet cosmic rockets are also discussed, and a bibliography is presented.

AD-258 851 Div. 12, 4, 8, 10, 14, 20, 27, 30
(30 June 61) OTS price $9.10

Army Rocket and Guided Missile Agency, Huntsville, Ala.
QUARTERLY RESEARCH REVIEW NO. 28, 1 NOVEMBER 1960 - 31 JANUARY 1961.
1 Mar 61, 99p. incl. illus. tables, 55 refs.
(Rept. no. ARGMA TN 2H1N-28)
Unclassified report

DESCRIPTORS: *Iron, *Radioactivation analysis, *Plastics, *Guided missile research, Reinforcing materials, Stresses, Shear stresses, *Rocket motor nozzles, Coatings, Tungsten, Graphite, *Nuclear physics, Niobium, Zirconium, Determination, *Gamma ray spectroscopy, *Rocket fuels, Combustion, *Rocket research, *Radiometers, Extraterrestial radio waves, *Noise, Crystal detectors, Thermoelectricity, *Plasma physics, Cathodes (Electron tubes), *Atomic spectrum.

MATERIALS - Viscoelastic behavior of polymers, and nozzle materials; NUCLEAR PHYSICS - Fast neutron-induced reactions in Nb and Zr; FUELS AND COMBUSTION - Burning-rate studies, and properties of a combustion vortex; PHYSICAL ELECTRONICS - The spectrum of amplitude-modulated noise after square-law detection; HIGH-TEMPERATURE PHYSICS - Conversion of thermal energy in a plasma to electrical energy, hollow-cathode discharge as a source for the determination of f-values, and f-value determination from non-equilibrium sources; and SOLID-STATE PHYSICS - Neutron activation analysis.

AD-258 933 Div. 12, 2, 5, 19
(30 June 61) OTS price $2.50

Office of Naval Research, Washington, D. C.
LECTURE SERIES, PROBLEMS OF SATELLITES AND SPACE OPERATIONS SPONSORED BY OFFICE OF NAVAL RESEARCH, APRIL-JULY 1958.
1960, 105p. incl. illus. tables (Rept. no. ONR-4)
Unclassified report

DESCRIPTORS: *Office of Naval Research, *Satellite vehicles, *Satellite vehicle research, *Space flight, Space navigation, Astronautics, Celestial mechanics, Tracking, Astronomical cameras, Astronomy, Spaceships.

Contents:
Problems of the space age, by Donald H. Menzel.
Some objectives of space research, by Homer E. Newell, Jr.
Space Navigation and celestial mechanics, by Gerald M. Clemence
Satellite tracking, by John P. Hagen
Satellite payload optimization, by N. Whitney Matthews
Astronomy and space operations, by Fred L. Whipple
Space communications, by Jerome B. Wiesner
The National Aeronautics and Space Administration, by Hugh L. Dryden

AD-258 959 Div. 12, 25
(3 July 61) OTS price $7.60

Stanford Research Inst., Menlo Park, Calif.
A STUDY OF THE MAGNETIC STABILIZATION OF A PASSIVE SATELLITE,
by J. B. Lomax, J. J. Brandstatter and others.
Final rept. Apr 61, 71p. incl. illus.
(Contract AF 30(602)2245)
(RADC TR 61-105) Unclassified report

DESCRIPTORS: *Satellite vehicles, Satellite vehicle antennas, Stability, *Stabilization, *Terrestrial magnetism, Torque, Radio communication systems, Radio waves, Reflection, Celestial mechanics, *Magnetic fields.

A predictable orientation of at least one axis of a satellite, employing only reliable passive components, is shown to be feasible. The interaction between the earth's magnetic field and a permanent magnet rigidly attached to the satellite tends to cause alignment of the magnetic axis of the satellite with the earth's field lines. Restoring, damping, and perturbation torques are derived and evaluated, and stability-of-motion equations are developed. The problem of a magnetized conductive body rotating and translating in a magnetic field is treated in some detail, with analytic solutions obtained for several particular cases. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-258 628 Div. 13, 2
(28 June 61) OTS price $7.60

Soil Stabilization Lab., Mass. Inst. of Tech., Cambridge.
SOIL STABILIZATION BY CHEMICAL METHODS,
Final rept. on Phase 12, 22 Oct 59-22 Oct 60. Nov 60, 1v. incl. illus. tables.
(Contract DA 22-079-eng-171)
Unclassified report

DESCRIPTORS: *Soils, Stabilization, *Chemicals, Phosphorus compounds, Cements, Calcium compounds, Oxides, Sodium compounds, Silicates, Asphalt.

Contents:
Soil stabilization with acidic phosphorus compounds
Soil stabilization with cement
Soil stabilization with lime
Soil stabilization with sodium silicates
Soil stabilization with asphalt emulsions

AD-258 683 Div. 13, 2
(28 June 61) OTS price $2.60

Texaco Inc., Bellaire, Tex.
LUNAR DRILL FEASIBILITY STUDY.
Final rept. 13 Jan 61, 1v. incl. illus. table.
(Subcontract to Jet Propulsion Lab., Pasadena, Calif. Contract NASw-6)
Unclassified report

DESCRIPTORS: *Drills, *Drilling machines, Design, Test equipment, Effectiveness, *Moon, Surfaces.

A short study has been conducted to determine the feasibility of a device for producing a hole in the lunar surface. The study includes both a literature survey and an experimental program. The experimental program investigated both rotary and percussive drilling with low thrust and no flushing fluid. Rotary drilling does not appear feasible due to the lack of sufficient thrust for effective cutting. Percussive drilling, on the other hand, appears to be quite acceptable for producing the required hole and is capable of reasonable drilling rates when the cuttings are removed from the hole mechanically. (Author)

AD-258 753 Div. 13
(29 June 61) OTS price $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
LITHIUM HYDROXIDE CANISTERS FOR PERSONNEL SHELTERS,
by R. J. Zablodil, J. W. Stephenson, and R. S. Chapler. Final rept. 13 June 61, 25p. incl. illus. tables (Technical rept. no. 151)
Unclassified report

14. MATERIALS (NON-METALLIC)

DESCRIPTORS: *Shelters, *Ventilation, Air, Air raid shelters, Carbon dioxide, Blowers, Purification, Absorption, Water vapor, *Air conditioning equipment, Dessicants, Hydroxides, *Lithium compounds, Personnel.

Because present hand-operated blowers at low crank speeds would not deliver enough air for a personnel shelter through the standard lithium hydroxide canister, a canister-blower device with two canisters paralleled was developed by NCEL. The device will deliver 15 cfm of air with 3% CO2 at a crank speed of 29 rpm. The unit reduced the CO2 in a 500 cu ft sealed room from about 3 to 1/2% during the first hour's run; in subsequent runs the reduction from 3% became succeedingly less. During the eighth and final run the concentration was reduced to just 2%. Good performance was obtained when air with 3% CO2 was passed through a canister at 7-1/2 cfm. (Author)

AD-258 830 Div. 13
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MOBILE TOWER CRANES, KTS-5-10 AND KTS-3-5,
by G. P. Tarakanov and M. V. Pustil'nikov.
8 Feb 61, 8p. (Trans. no. MCL-815 of Byulieten' Tekhniko-Ekonomicheskoy Informatsii 7:37-40, 1960)
Unclassified report

DESCRIPTORS: *Hoists, USSR, Specifications, Design, Construction.

AD-258 889 Div. 13, 32
(3 July 61) OTS price $2.60

Arctic Construction and Frost Effects Lab., Corps of Engineers, Waltham, Mass.
LIST OF REPORTS OF THE ARCTIC CONSTRUCTION AND FROST EFFECTS LABORATORY,
1956, rev. Jan 61. 20p. (Miscellaneous paper no. 14 rev. supersedes Miscellaneous paper no. 14, AD-209 284)
Unclassified report

DESCRIPTORS: Scientific reports, Reports, Military publications, Records, *Indexes, Military engineering, Military research, Arctic regions, *Construction, Soils, Pavements, Ice, Landing fields, Permafrost, Freezing.

Lists are presented of the more important reports and other publications of the Arctic Construction and Frost Effects Laboratory (ACFEL), U. S. Army Engineer Division, New England. In addition to the more widely distributed ACFEL reports, a number of draft, preliminary, and intraoffice reports are included because the latter group of reports frequently have appreciable interim value pending issuance in final form. Reports having security classification are not included. The reports prepared by the former Permafrost Division of the St. Paul District, Corps of Engineers, functions and responsibilities of which were transferred on 1 March 1953 to the New England Division, are included but not differentiated from other publications. (Author)

AD-258 395 Div. 14, 8
(23 June 61) OTS price $2.60

Synthetic Mica Co., West Caldwell, N. J.
DEVELOPMENT OF ULTRA HIGH TEMPERATURE DIELECTRIC MATERIALS FOR EMBEDDING AND ENCAPSULATING ELECTRONIC COMPONENTS,
by F. A. Barr and J. P. McCarthy. Quarterly progress rept. no. 2, 17 Aug-16 Nov 60. 16 Nov 60, 21p. incl. illus. tables.
(Contract NObs-78714)
Unclassified report

DESCRIPTORS: *Mica, Dielectrics, High temperature research, *Embedding substances, *Encapsulation, Aluminum compounds, Phosphates, Glass, Coatings, Electronic equipment, Binders, Porosity, Physical properties, Electrical properties, Materials.

Increasing the concentration of aqueous aluminum phosphate decreased the porosity of phosphate-bonded synthetic mica compound. Porosity can be decreased by glass coatings but the thermal expansion of the glass must match that of the sample. A volume shrinkage of approximately 7% was calculated for a standard phosphate-bonded synthetic mica compound. Initial results of electrical properties at elevated temperatures indicate that the phosphate-bonded synthetic mica systems are suitable for 500 C use. Commercial electronic components (magnetic amplifiers, capacitors, and small motors) were successfully potted and encapsulated with the bonded synthetic mica compound. (Author)

AD-258 423 Div. 14, 22
(23 June 61) OTS price $2.60

Rocketdyne, Canoga Park, Calif.
PREIMPREGNATED ROVING STUDY,
Monthly progress rept., 30 Apr-31 May 61. 15 June 61, 19p. incl. illus. table (Rept. no. R-3024-2)
(Contract NOw 61-0498-c)
Unclassified report

DESCRIPTORS: *Impregnation, Resins, *Test equipment, Tests, Filament wound construction, Plastic thread, *Epoxy resins, Synthetic fibers, *Textiles, Pressure, Hydrostatic pressure, Temperature, Rocket cases, Propellant tanks.

Engineering development effort was continued on the study of preimpregnated roving in numerically controlled equipment. The tests on the effects of resin advancement, storage temperature, and winding procedures on the strength properties of 3-in.-ID test cylinders were started and are continuing. A device employing a rolling steel ball was adopted and used for testing the tackiness of preimpregnated roving. The use of this equipment is now being studied. A preheater for warming the roving during winding operations was constructed and is in use, and a special experimental test fixture for mounting various combinations of pulleys and brakes is presently being constructed. (Author)

AD-258 498 Div. 14, 16, 32
(22 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
NATURAL DECAY RESISTANCE OF FOREIGN WOODS:

LABORATORY TESTS OF AFRICAN OAK, PARINARIUM, WISHMORE, AND LIBERIAN PINE,
by Joe W. Clark. Progress rept. Dec 60, 2p. table.
(Sponsored by the Bureau of Ships)
Unclassified report

DESCRIPTORS: *Wood, Trees, Tests, Fungi, Deterioration, Inhibition, Forestry.

According to a four-class scale of decay resistance--highly resistant, resistant, moderately resistant, and nonresistant--heartwood samples from two logs of African oak (Gilbertiodendron preussii (Harms) J. Leonard) tested by the soil-block method were indicated to be resistant to both brown and white rot fungi. Three other African species appraised in the same limited manner, parinarium (Parinari holstii Engelman), wishmore (Tarrietia utilis Sprague), and Liberian pine (Tetraberlinia tubmaniana J. Leonard), were only moderately resistant. These results compare to earlier work when ekki (Lophira alata Banks ex Gaertn. f.) was indicated to be highly resistant and kokrodura (Afrormosia elata Harms) from resistant to highly resistant. (Author)

AD-258 537 . Div. 14
(27 June 61) OTS price $1.75

Carborundum Co., Niagara Falls, N. Y.
FACTORS AFFECTING THERMAL SHOCK RESISTANCE OF POLYPHASE CERAMIC BODIES,
by P. T. B. Shaffer, D. P. H. Hasselman, and A. Z. Chaberski. Rept. for Oct 59-Oct 60 on Ceramic and Cermet Materials. Feb 61, 62p. incl. illus. table, 21 refs.
(Contract AF 33(616)6806, Proj. 7350)
(WADD TR 60-749, pt. 1) Unclassified report

DESCRIPTORS: Stresses, *Ceramic materials, *Zirconium compounds, Carbides, *Graphite, *Shock resistance, Thermal stresses, Theory, Thermal expansion, Thermal conductivity, Thermal diffusion, Mechanical properties, Refractory materials, Shear stresses, Elasticity, Mathematical analysis, Test methods, Test equipment, Porosity, X-ray diffraction analysis, Fracture (Mechanics), Microstructure.

An investigation of the factors which effect the thermal shock resistance of polyphase ceramic systems was conducted with the model system zirconium carbide-graphite. The research was divided into two areas: (1) theoretical calculations of the individual material properties, which show that the included graphite particles may be regarded as spherical pores; and (2) experimental data, which substantiate the postulate that increased thermal shock resistance is a result of an increase in the ratio of strength over Young's modulus, brought about by the addition of the low Young's modulus phase. (Author)

AD-258 574 Div. 14, 17
(27 June 61) OTS price $4.60

New York U. Coll. of Engineering, N. Y.
REFRACTORY COATINGS FOR TUNGSTEN,
by C. G. Goetzel and P. Landler. Rept. for Nov 59-Oct 60, on Refractory Inorganic Non-Metallic Materials. Mar 61, 42p. incl. illus. tables, 51 refs.
(Contract AF 33(616)6868, Proj. 7350)
(WADD TR 60-825) Unclassified report

DESCRIPTORS: *Tungsten, Tungsten wire, Coatings, *Refractory coatings, Silicon coatings, Tungsten compounds, Silicides, Oxidation, Brittle materials, Diffusion, Vapor plating, Processing, Oxides, Oxidation inhibitors, Zirconium compounds, High temperature research, Flame spraying.

A study of the feasibility of protecting W wires against oxidation at 3300 F was undertaken. An WSi2 coat was the most promising coating for this temperature. Several siliconizing methods were given a cursory treatment, and the simplest, cementation, was selected for closer investigation. This operation was performed under flowing H atmosphere and such variables as temperature, time, and composition of the cementation pack. A single brittle WSi2 layer is formed by this method. Pack-siliconized wires can withstand oxidation at 3300 F in still air for 10 or more hours. A drawback of the disilicide coat is its low temperature oxidation which occurs in parts exposed at 1200 and 2280 F for prolonged periods. Attempts to deposit ZrO2 on top of siliconized wires by means of plasma arc spray method remained largely unsuccessful. (Author)

AD-258 595 Div. 14, 1
(27 June 61) OTS price $1.00

Nonmetallic Materials Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
ULTRA VIOLET RADIATION RESISTANT MATERIALS FOR DECELERATORS,
by Joyce C. McGrath. Rept. for July 59-July 60 on Fibrous Materials for Decelerators and Structures. Dec 60, 25p. incl. illus. tables.
(Proj. 7320)
(WADD TN 60-253) Unclassified report

DESCRIPTORS: *Nylon, *Nylon thread, *Parachute fabrics, Parachutes, *Synthetic fibers, Deceleration, Textiles, Ultraviolet radiation, Aging, Climatic factors, Dyes, Mechanical properties, Tests, Stresses, Failure (Mechanics), *Materials.

Two improved types of nylon yarns (1) Type 330, 30 denier, a more UV radiation and heat resistant yarn and (2) Type 300, 30 denier, a higher strength than the conventional nylon yarn, were developed to be used in materials for personnel and other type decelerators. Cloth, woven of the 2 types of nylon yarn, in both natural and International Orange were exposed to (1) outdoor weathering, (2) accelerated aging and (3) a temperature of 300 F. Type 330 nylon cloth in natural color retained a very high percentage of strength under all 3 exposure conditions; the Type 330, International Orange and the Type 300 in both natural and International Orange deteriorated at a very rapid rate after exposure to both outdoor weathering and accelerated aging. It was determined that the type of dye used to obtain the International Orange color, was the chief factor in strength loss of the dyed Type 330 cloth. (Author)

AD-258 597 Div. 14, 8
(27 June 61) OTS price $1.00

Nonmetallic Materials Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
EXTREME TEMPERATURE RANGE ORGANIC COOLANTS.

PART I. -80 F TO 400 F TEMPERATURE RANGE FLUIDS.
by Dale A. Barsness. Rept. for Nov 59-Sep 60 on Nonmetallic and Composite Materials. Dec 60. 27p. incl. tables, 11 refs.
(Proj. 7340)
(WADD TR 60-795, pt.1) Unclassified report

DESCRIPTORS: *Coolants, Liquids, Heat transfer, *Electronic equipment, Space environmental conditions, *Silicones, Silicates, Amines, Fluorocarbons, Chlorine compounds, Esters, Oils, Electrical properties, Stability, Physical properties, High temperature research, Low temperature research, Dielectric properties, Organic compounds.

A review of the status of extreme temperature range (ETR) coolants for electronic equipment is presented. The fluids considered for use over a -80 F to 400 F temperature range are described in this report and fall into the following class of compounds: amines, chlorofluoro-carbon oils, fluorochemicals, silicones, silicate esters, and siloxanes. Results show that the silicone fluids comply most closely to the physical properties required for ETR electronic coolants. It was observed that they are the only group of materials that possess high boiling points and thermal stabilities above the 400 F bulk operational temperature, and still display reasonably low viscosity values within the extreme temperature range. The electrical properties of these materials are also very desirable. The data on the new experimental research fluids, list properties important to future coolants for electronic components. These data include the viscosity-temperature relation, vapor pressure-temperature properties electrical characteristics, thermal properties and flammability characteristics. (Author)

AD-258 627 Div. 14, 11, 30
(28 June 61) OTS price $11.50

AutoResearch Labs., Inc., Chicago, Ill.
DEVELOPMENT OF QUALIFICATION TEST METHODS FOR GEAR LUBRICANTS,
by D. L. Powell, Final summary rept 1952-1960. 1960,1v. incl. illus. tables.
(Subcontract to Armour Research Foundation, Contract DA 11-022-ORD-905, Proj. TB5-2)
Unclassified report

DESCRIPTORS: *Lubricants, *Gears, Axle shafts, *Cargo vehicles, Corrosion, Storage, Humidity, Test methods, *Propulsion gears, Tests, Oils.

A multi-phase experimental and analytical project was undertaken to develop test procedures for the evaluation of hypoid gear lubricants and to study the loading, temperature and sliding velocity conditions which exist on automotive hypoid gears. The investigation was conducted in a number of phases: (1) development of moisture corrosion test technique, (2) study of dynamic loading of automotive hypoid gears, (3) study of sliding velocity of automotive hypoid gears, (4) study of unit surface loading of hypoid gears, (5) study of dynamic surface temperatures of hypoid gears, and (6) cooperation with the CRC gear lubricants group in the development of test techniques and field and laboratory investigations. A general discussion is presented of the object of each phase, the method of testing, the general results, along with a discussion of the results and the conclusions drawn from the work. (Author)

AD-258 808 Div. 14
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROGRESS IN DEVELOPMENT OF OSCILLATION-DAMPENING MATERIAL,
by Lothar Bohn, Friedrich Linhardt, and Hermann Oberst. 27 Jan 61, 25p. incl. illus. 15 refs.
(Trans. no. MCL-421 of Fortschritte in Der Entwicklung Schwingungsdaempfender Stoffe, 25p.)
Unclassified report

DESCRIPTORS: Metals, Sheets, Vibration, Damping, *Coatings, Plastic coatings, Polymers, *Insulating materials, Porous materials, *Acoustic insulation, Materials, Vibration isolators, Laminates, Germany, Sandwich construction, Elasticity, Temperature.

AD-258 900 Div. 14
(3 July 61) OTS price $2.60

Forest Products Lab., Madison, Wis.
PREDICTING THE STRENGTH OF REINFORCED PLASTIC LAMINATES WITH TEMPERATURE GRADIENTS,
by Kenneth H. Boller. June 61, 1v. incl. illus. tables (Rept. no. 1881)
(Contract NAer-01967; In cooperation with Wisconsin U.)
Unclassified report

DESCRIPTORS: *Plastics, *Laminates, Silicone resins, Phenolic resins, Silanes, Phenyl radicals, Glass textiles, Asbestos fiber, Reinforcing materials, Temperature, Surfaces, Stresses, Mechanical properties, *Failure (Mechanics), High temperature research, Heat resistant polymers, Theory, Mathematical analysis, Test methods, Mathematical prediction.

A simple theoretical method was developed to predict the strength of reinforced plastic laminates when thermal gradients exist through the thickness. Theoretical values are compared with experimental data from compression and tension tests. The observed strength was equal to or slightly greater than what the theory predicts, so it was concluded that the theory is conservative and useful for the solution of thermal gradient problems. (Author)

AD-258 971 Div. 14, 27
(30 June 61) OTS price $3.60

Value Engineering Co., Alexandria, Va.
ELECTRODEPOSITION OF EROSION AND OXIDATION RESISTANT COATINGS FOR GRAPHITE,
by C. H. Wright, G. F. Bargero, and J. Huminik, Jr. Quarterly progress rept. 23 Feb-23 May 61. 15 June 61, 27p. 97 refs.
(Contract NOw 61-0670)
Unclassified report

DESCRIPTORS: Rocket motor nozzles, *Graphite, *Coatings, *Electrodeposition, *Ceramic coatings, Cermets, Chromium plating, Ceramic materials, Metallic compounds, Borides, Carbides,

Nitrides, Erosion, Oxides, Silicides, Oxidation inhibitors, Refractory coatings, Processing, *Bibliography.

An investigation was begun to develop and evaluate erosion and oxidation resistant coatings produced by electrodeposition on graphite for rocket nozzle applications. The deposition process involves a simple Cr plating solution in which 1- to 50-micron ceramic particles are suspended. The coating appears to be a uniform dispersion of ceramic particles in a metal matrix which has ductility and high temperature resistance. Studies will also be made of: (1) variations of the particle content; (2) heat treatment of the coating (possible conversion of the metal to an oxide); (3) physical property determinations including thermal shock and oxidation resistance, thermal expansion, thermal conductivity, adhesion, ductility, and hardness and its effect on performance; and (4) tests of small-scale coated nozzles in a gaseous rocket motor. The materials selected (on the basis of a literature review) for evaluation in combination with Cr include the borides and carbides of Ta, Hf, Zr, the nitrides of B and Si, ZrO2, Wb, ZrB2 + Mo2Si3, NbC, and SiC. Fourteen specimens will be made for laboratory testing of each material of various coating thicknesses from each of 3 particle size groups (8 microns or less, 8 to 20 microns, and 20 to 44 microns).

AD-259 000 Div. 14
OTS price $7.00

Armed Services Technical Information Agency, Arlington, Va.
PLASTICS. AN ASTIA REPORT BIBLIOGRAPHY.
Aug 61, 698p. 3926 refs.
Unclassified report

DESCRIPTORS: *Plastics, Adhesives, Cellulose, *Polymers, *Heat resistant polymers, Resins, Polymer solutions, Phenolic resins, Acrylic resins, Epoxides, *Silicones, Amides, Plastic coatings, *Bibliography, *Laminates, Expanded plastics, Fibers, Textiles, *Elastomers, Vinyl chlorides, *Plasticizers, *Fluorocarbons.

References pertaining to plastics were selected from all unclassified documents cataloged by ASTIA from 1953 through 1960. The subject content is presented under the following headings: acrylics, adhesives, cellulosics, coatings, elastomers, expanded plastics, epoxides, fibers and textiles, fluoroplastics, heat resistant polymers, laminates, optical plastics, phenolics, polyesters, polyethylenes, polymer solutions, polymers, polystyrenes, resins, silicon base, vinyls, general and miscellaneous. (References to documents cataloged prior to 1953 are identified by ATI and TIP numbers and are listed in ASTIA bibliographies AD-26 266, AD-65 082, and AD-59 706.)

AD-259 041 Div. 14, 3, 13, 26
(6 July 61) OTS price $1.60

Institute of Paper Chemistry, Appleton, Wis.
DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL,
by L. E. Leporte and T. A. Howells. Monthly progress rept. no. 8, 29 Apr-28 May 61. 27 June 61, 14p. incl. tables.
(Contracts DA 18-108-405-cml-941 and DA 18-108-cml-6561)
Unclassified report

DESCRIPTORS: *Fiberboard, Insulating materials, Shelters, Wood pulp, Charcoal, Additives, Production, Gases, Chemical warfare agents, Poisonous gases, Aerosols, Penetration, Cyanogen chlorides, Deterioration, Mildew, Moistureproofing, Fungicides.

Gas life evaluations are reported for boards made to test the effect of various sizing agents. Excessive amounts of Aquapel or Cyron cause a loss in gas life. It appears necessary to compromise at a level which will yield the best sizing with a minimum loss of gas life. Boards were made with spruce, pine, and willow groundwoods to develop more information on the effect of wood species on gas life. Another board was planed and analyzed for charcoal content to determine whether the nature of the charcoal distribution was responsible for loss of gas life on planing. Differences in charcoal content were not as great as losses in gas life previously noticed. TBTO (bis tri-n-butyltin oxide) seemed most effective for mildew resistance without excessive loss of gas life. (Author)

15. MATHEMATICS

AD-258 397 Div. 15
(26 June 61) OTS price $6.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
SHORT-TIME STABILITY IN LINEAR TIME-VARYING SYSTEMS,
by Peter Dorato. 9 May 61, 61p. incl. illus. 43 refs. (Research rept. no. PIBMRI-908-61)
(Contract AF 18(603)105)
(AFOSR-748)
Unclassified report

DESCRIPTORS: *Linear systems, Stability, Differential equations, *Time lag theory, Reliability, Feedback.

The concept of short-time stability finds application in missile and satellite systems where operating times are often of finite duration. Short-time stability assures, in a finite time interval, that all inputs bounded by a prescribed constant Greek epsilon result in outputs bounded by a second prescribed constant. The study of short-time stability is divided into two categories: undriven systems and driven systems. Undriven systems are represented by a set of differential equations. Sufficient conditions for short-time stability are given in terms of the coefficients. Driven systems are represented by their impulse response. A necessary and sufficient condition for short-time stability in driven systems is given directly in terms of impulse response. Sufficient conditions for short-time stability in feedback systems, in terms of the open loop impulse response are also included. In addition the concept of short-time C-equivalence, essentially a structural stability concept, is introduced. Necessary and sufficient conditions for two systems to be short-time C-equivalent are presented. (Author)

AD-258 419 Div. 15
(22 June 61) OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
GAUSSIAN PROBABILITY MEASURE DEFINED BY A GENERALIZED RELATIVE DENSITY,
by William C. Taylor. Mar 61, 17p. (BRL rept. no. 1109)
Unclassified report

DESCRIPTORS: *Measure theory, *Probability, Density.

A generalized gaussian relative probability density is introduced in an infinite dimensional linear space. Although it is zero with probability one, it achieves to describe an actual probability distribution in another space by the behavior of its maxima on linear varieties. (Author)

AD-258 432 Div. 15
(22 June 61) OTS price $9.10

Institute of Statistics, North Carolina State Coll., Raleigh.
AN EVALUATION OF THE WORTH OF SOME SELECTION INDICES,
by J. S. Williams, C. C. Cockerham, and S. N. Roy. Apr 61, 100p. incl. illus. table (Mimeograph series no. 281)
(Contract Nonr-48604, Proj. NR 042-202)
Unclassified report

DESCRIPTORS: Statistical distributions, Statistical functions, Statistical analysis, *Statistical processes, Selection, Effectiveness, Sampling, Probability, Indexes, Population, Analysis of variance.

Contents:
The probability of selecting one of the first m-ranked variables from a sample of k unknown variables based on the selection of the maximum observable sum of the unknown variables and error variables
Sample selection indices derived from the probability of selecting one of the m largest unknown variables based on selection of the largest sample observation
Methods of comparing three sample indices
An illustration of the properties of sample estimates used in constructing a selection index

AD-258 557 Div. 15, 1
(27 June 61) OTS price $1.10

Cruft Lab., Harvard U., Cambridge, Mass.
FINAL VALUE CONTROL PROBLEMS AND THE METHOD OF CONSTRAINED DESCENT,
by Yu-Chi Ho. 10 Apr 61, 5p. (Technical rept. no. 340)
(Contract Nonr-186616, Proj. NR-372-012)
Unclassified report

DESCRIPTORS: *Control systems, Flight paths, Mathematical analysis, *Matrix algebra.

Solution of the vector matrix equation Ax equals b is discussed, subject to the constraint that x is greater than or equal to L(-) and less than or equal to L(+), where 0 is greater than or equal to L(-) and less than or equal to L(+), and L(+)-L(-) is greater than 0. Here, A is an r x n matrix; b is an r vector; L(+), L(-), and x are n vectors. Such problems often arise in the consideration of final value control systems. In such case b is visualized as the vector representing the desired final state of the system; x, the control to be applied at successive control intervals 1,..,n; A, the matrix of influence coefficients which represent the effect of the components of x on the final state of the system; L(+) and L(-), the limits for the control vector x, reflecting practical constraints for allowable variations of x. Solutions to the above mentioned problem may be nonexistent or infinite in number. The purpose of this paper is to illustrate a systematic way of solving such a problem which does not require advanced knowledge concerning the existence of solutions. (Author)

AD-258 617 Div. 15, 6, 8
(30 June 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A METHOD OF SIGNAL DESIGN EMPLOYING SADDLE POINT INTEGRATION,
by Ronald D. Haggarty. 19 May 61, 17p. illus. (Rept. no. 41G-0009)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Integral equations, Integration, *Radar signals, Integral transforms, Radar transmitters, Radar receivers, Theory, Series.

The problem of specifying both the envelope of a radar's transmitted signal and the matched receiver output waveform involves the solution of an integral equation. Approximate solutions of the integral equation which are valid for the large Time-Bandwidth case are studied. First, a solution obtained by the Stationary Phase method of integration is reviewed, and some of its limitations examined. Then the stationary phase solution is extended by the use of Saddle Point Method of integration. The saddle point solution and a consideration of the assumptions necessary to obtain it is used to determine the restrictions on the use of the Stationary phase solution. In addition, an estimate of the time-bandwidth product necessary to yield a satisfactory result is made. (Author)

AD-258 670 Div. 15
(28 June 61) OTS price $8.60

Naval Ordnance Lab., White Oak, Md.
ON AN ANALOGUE OF THE EULER-CAUCHY POLYGON

Division 15 - MATHEMATICS

METHOD FOR THE PARTIAL DIFFERENTIAL EQUATION $u_{x_1 \ldots x_n} = f$,
by Irving Glick. 20 Apr 61, 92p. (Rept. no. NOLTR 61-26; Mathematics Dept. Rept. no. M-18)
Unclassified report

DESCRIPTORS: *Partial differential equations, Analog computers, *Numerical analysis, Sequences, Functions.

This paper gives constructive proofs of existence theorems for two cases of the partial differential equation u sub x1...sub xn equals f where f is a function of x sub 1,...,x sub n, u and the pure mixed partial derivatives of u up through order n-1. The method used is an analogue of the Euler-Cauchy polygon method and yields a numerically feasible procedure for constructing solutions. Two inequalities of independent interest are proved as lemmata for the existence proofs, and the properties of an interesting class of interpolatory functions are obtained. (Author)

AD-258 891 Div. 15
(3 July 61) OTS price $1.60

Cruft Lab., Harvard U., Cambridge, Mass.
THE ANALYSIS OF A SECOND-ORDER LINEAR DIFFERENTIAL EQUATION WITH EXPONENTIALLY VARYING GAIN,
by T. S. Baker and K. S. Narendra. 15 Mar 61, 17p. incl. illus. (Technical rept. no. 334)
(Contract Nonr-186616, Proj. NR-372-012)
Unclassified report

DESCRIPTORS: *Differential equations, *Control systems, Analog computers, *Linear systems, Integral transforms, Bessel functions, Analysis.

AD-258 901 Div. 15
(17 July 61) OTS price $1.10

Columbia U., New York.
A THEOREM ON COMPACT SIMPLE SEMIGROUPS,
by M. P. Heble. 30 June 61, 6p. (Rept. no. CU-27-61)
(Contract Nonr-26659, Proj. 042-205)
Unclassified report

DESCRIPTORS: *Groups (Mathematics), *Measure theory, Functional analysis, Topology.

Proof is given for the conjecture of M. Rosenblatt (J. Math. and Mech. 9:293-306, 1960) concerning the factorization of idempotent probability measures on compact simple semigroups. The measures are shown to contain factors of Haar measure on a compact topological group and probability measures on two compact Hausdorff spaces.

AD-258 908 Div. 15
(12 July 61) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
BOUNDS FOR DERIVATIVES IN THE DIRICHLET PROBLEM FOR POISSON'S EQUATION,
by J. H. Bramble and L. E. Payne. May 61, 30p. (Technical note no. BN-248)
(Contract AF 49(638)228)
(AFOSR-940) Unclassified report

DESCRIPTORS: *Partial differential equations, *Potential theory, Inequalities, Integral equations, Operators (Mathematics), Green's function, Integration.

Inequalities are derived which lead to pointwise bounds for derivatives of the solution of the Dirichlet problem for the Poisson equation. We obtain at interior points bounds for first and second derivatives which involve the undifferentiated data providing the boundary data are square integrable and the Laplacian of the function is Holder continuous in D. (Author)

AD-258 918 Div. 15
(30 June 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A METHOD FOR FINDING OUTPUT PROBABILITY DENSITIES,
by R. P. Wishner. 20 June 61, 15p. incl. illus. (Rept. no. 47G-0026)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Probability, *Noise, Density, *Information theory, Integral equations, Linear systems, Non-linear systems.

A method is presented for finding output probability densities of linear and nonlinear systems. The method utilizes an interesting application of the theory of conditional probabilities. The method is especially useful for some cases of non-Gaussian noise in linear systems. (Author)

AD-258 929 Div. 15
(3 July 61) OTS price $3.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON A CLASS OF SINGULAR SOLUTIONS OF THE EULER-POISSON-DARBOUX EQUATION,
by D. K. Suschowk. Apr 61, 30p. (Technical note no. BN-238)
(Contract AF 49(638)228)
(AFOSR-834) Unclassified report

DESCRIPTORS: *Partial differential equations, Functions, Integral transforms, *Integral equations.

The relations between a class of singular solutions of the Euler-Poisson-Darboux equation and the (regular) solutions of Weinstein-Lions are investigated. A modified radiation problem is formulated and reduced to Weinstein's generalized radiation problem. Finally another problem is exhibited, which admits a uniquely determined solution in the case where neither the generalized nor the classical radiation problem has a nontrivial solution. This problem, moreover, is always possible, as long as the real part of the parameter occurring in the Euler-Poisson-Darboux equation is positive. (Author)

AD-258 985 Div. 15
(5 July 61) OTS price $1.60

British Columbia U. (Canada).
SOME RESULTS ON NON-NEGATIVE MATRICES,
by Marvin Marcus, Henryk Minc, and B. N. Moyls. Apr 61, 16p.
(Contract AF 49(638)776)
(AFOSR-599) Unclassified report

DESCRIPTORS: *Matrix algebra, Functions, Combinatorial analysis, *Algebra.

AD-258 986 Div. 15
(5 July 61) OTS price $4.60

British Columbia U. (Canada).
(No title).
8 Aug 60, 45p.
(Contract AF 49(638)776)
Unclassified report

DESCRIPTORS: *Matrix algebra, Combinatorial analysis, Transformations (Mathematics), Functions, *Algebra, Sequences, *Determinants.

This report includes:
THE PERMANENT FUNCTION, by Marvin Marcus and F. C. May. Aug 60, 25p.
(Contract AF 49(638)776)
(AFOSR-13)

ON THE RELATION BETWEEN THE DETERMINANT AND THE PERMANENT, by Marvin Marcus and Henryk Minc. Aug 60, 10p.
(Contract AF 49(638)776)
(AFOSR-12)

PERMANENT PRESERVERS ON THE SPACE OF DOUBLY STOCHASTIC MATRICES, by B. N. Moyls, Marvin Marcus, and Henryk Minc. Aug 60, 8p.
(Contract AF 49(638)776)
(AFOSR-11)

AD-259 024 Div. 15
(6 July 61) OTS price $6.60

Columbia U., New York.
ASYMPTOTIC THEORY FOR PRINCIPAL COMPONENT ANALYSIS,
by T. W. Anderson. 3 Feb 61, 57p. (Rept. no. CU-48-61-Nonr-26633 MS)
(Contracts Nonr-26633 and Nonr-327900)
Unclassified report

DESCRIPTORS: *Analysis of variance, Measure theory, Sampling, Probability, Matrix algebra, *Statistical functions, Statistical distributions, *Statistical analysis.

The asymptotic distribution of the characteristic roots and (normalized) vectors of a sample covariance matrix is given when the observations are from a multivariate normal distribution whose covariance matrix has characteristic roots of arbitrary multiplicity. The elements of each characteristic vector are the coefficients of a principal component (with sum of squares of coefficients being unity), and the corresponding characteristic root is the variance of the principal component. Tests of hypotheses of equality of population roots are treated, and confidence intervals for assumed equal roots are given; these are useful in assessing the importance of principal components. A similar study for correlation matrices is considered. (Author)

16. MEDICAL SCIENCES

AD-258 570 Div. 16
(26 June 61) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
ERYTHROPOIETIC STIMULATING FACTOR PRODUCTION IN PUBESCENT MICE AFTER A SINGLE EXPOSURE TO HYPOXIA,
by J. K. Colehour. 20 Sep 60, 4p. incl. illus.
(Rept. no. 1)
(Proj. MR005.06-0060)
Unclassified report

DESCRIPTORS: *Anoxia, *Erythrocytes, Growth, High altitude, Physiology, Reticulocytosis, *Reticulo-endothelial system, Counting methods, Polycythemia, Pituitary hormones, Age factors.

When animals are exposed continuously to hypoxia, the following sequence of hematological events occurs: production of erythropoietic stimulating factor (ESF), reticulocytosis, and polycythemia. Humoral changes occur during the first day at altitude, but it is not known how soon EST is produced or whether it is produced equally by juveniles and adults alike. In this experiment these factors are investigated: (a) ESF production after short-time hypoxic exposure and (b) ESF production under the same conditions in pubescent BDF1 mice. The results indicate that ESF is produced in this strain of mice after a six-hour exposure to 22,000 feet. It is further demonstrated that these mice have augmented response to hypoxia at the time of increased endocrine function at puberty. (Author)

AD-258 571 Div. 16
(26 June 61) OTS price $1.60

Naval School of Aviation Medicine, Pensacola, Fla.
THE VELOCITY-VOLUME LOOP,
by Roscoe G. Bartlett, Jr., and Norman E. Phillips. 3 Jan 61, 19p. incl. illus. (Rept. no. 1)
(Proj. MR005.13-3100)
Unclassified report

DESCRIPTORS: Velocity, *Respiration, Time, Measurement, Respiratory system, Analysis, *Volumetric analysis, Volume, Test methods, Aging, Respiratory diseases, Lungs, Acceleration.

The breath velocity-volume (V-V) loop is introduced as a composite pulmonary function test. From two V-V loops, a tidal loop and a forced vital capacity loop, a broad analysis of pulmonary function may be made including a complete spirogram, maximum breathing capacity prediction, breath timing, breath accelerations, and reserve velocities. (Author)

AD-258 575 Div. 16
(27 June 61) OTS price $1.60

Stanford Medical Center, Palo Alto, Calif.
HEMODYNAMIC EFFECTS OF INTRAVENOUS SODIUM CITRATE,
by John P. Bunker, Henrik H. Bendixen, and Anna J. Murphy. Progress rept. on Metabolic Effects of Blood Transfusion. June 61, 8p. tables, 24 refs.
(Contract DA 49-193-md-2135; Continuation of Massachusetts General Hospital, Boston, Contract DA 49-007-md-555)
Unclassified report

DESCRIPTORS: *Blood transfusions, Sodium compounds, Citrates, Man, Blood protein, Biochemical tests, Analysis, Blood pressure, *Metabolism, Hypotension, Calcium, Blood vessels, Heart, Intravenous feeding, Serum, Anesthesia, Electrocardiography.

Marked elevations of serum citrate have been reported to occur in man during multiple rapid transfusion of citrated blood. The possibility of harmful effects is well recognized but often discounted. In an attempt to separate the circulatory effects of citrate from many other potentially adverse effects of massive transfusion, we have studied the hemodynamic effects of intravenous infusions of sodium citrate in normal, lightly anesthetized man, and in the experimental dog. (Author)

AD-258 624 Div. 16
(6 July 61) OTS price $1.10

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
EVALUATION OF THE ROBIN-AID HAND,
by John W. Hodge, Jr., V. T. Riblett, and A. H. Brown. Feb 61, 3p. illus. (Technical rept. no. 6104)

Unclassified report

DESCRIPTORS: *Prosthetics, *Hands, Tests, Effectiveness.

An evaluation of 2 mechanical hands consisted of functional and cyclic tests. The functional tests included cable forces, pinch, cable excursion, and finger opening. The hands were cyclic tested under simulated wearer conditions. The cable force of 18 lbs to fully open the fingers of Hand 1192 with glove seems excessive. It is felt that consideration should be given to reducing the maximum cable forces for operating this type hand. Cyclic tests indicated that the weakest point in the hands is the main springs. The two springs broke at 3500 and 8540 cycles, respectively. It is felt that the number of wear cycles could be increased with a better design to eliminate bending on loading the spring. (Author)

AD-258 630 Div. 16
(28 June 61) OTS price $1.60

Institute of Optics, U. of Rochester, N. Y.
MECHANISMS OF ENERGY TRANSFER IN BIOLOGICAL SYSTEMS,
by James C. Peskin. Final rept. 15 June 61, 17p. incl. tables.
(Contract Nonr-119000)

Unclassified report

DESCRIPTORS: *Biophysics, *Energy, *Biochemistry, Vision, Light, Absorption, Chemical reactions, Retinene, Amines, Amino acids, Thiols, Chemical bonds, Production, Photochemical reactions, Nerves, Excitation.

The sequence of events in the retinal rod leading to a nerve impulse can be summarized as follows: The absorption of a quantum results in an excited state involving the retinene-protein bond. The absorbed energy may migrate by exciton transfer to the site of the reaction sequence which results in membrane activation. This second system requires only an initial activation before proceeding spontaneously. After the energy transfer the retinene is detached from its protein bond and appears as free retinene for a brief interval before it reacts secondarily to form amino bonds with substances present in the rod or in solution. (Author)

AD-258 693 Div. 16
(28 June 61) OTS price $1.60

Jefferson Medical Coll., Philadelphia, Pa.
VARIOUS ASPECTS OF ASIATIC CHOLERA.
Final rept. 26 June 61, 2p.
(Contract DA 49-007-md-2008)

Unclassified report

DESCRIPTORS: *Cholera, *Asia, Medical examination, Microbiology, Intestinal bacteria, Serum, Bacterial vaccines, Diagnosis, Thailand, *Medical research, Test methods, Medicine, Tests, Plants, Motion, Excretion, Metabolic products.

Immediate studies include (a) an evaluation of bacteriologic diagnostic methods, some of which are being used in the field for the first time, (b) an investigation of the numbers of vibrios in cholera stools, (c) attempts to demonstrate endotoxins and/or mucinase in stools, (d) an evaluation of the pH and eH potentials of stools with reference to flora, and (e) a study of the problem of motility of gastro-intestinal tract. (Author)

AD-258 723 Div. 16
(29 June 61) OTS price $1.10

Institute for Cancer Research, Philadelphia, Pa.
RESEARCH ON BACTERIAL VIRUSES,
by Thomas F. Anderson. Final rept. 1 Jan-1 June 61. 1 June 61, 4p.
(Contract Nonr-279100)

Unclassified report

DESCRIPTORS: *Bacteriophages, Microbiology, *Cancer research, Biochemical tests, Serum, *Viruses, Scientific research, *Medical research, Medical examination.

Research is being undertaken to determine the morphologies of a number of bacteriophages; to determine the function of their organelles; to elucidate the mechanisms by which the organelles are assembled to make infectious bacteriophage particles within the host cell. (Author)

AD-258 743 Div. 16
(6 July 61) OTS price $1.60

Army Prosthetics Research Lab., Walter Reed Army Medical Center, Washington, D. C.
TENTATIVE STANDARDS, HAND, MECHANICAL, FOR UPPER EXTREMITY AMPUTEES, SIZE I,
by Victor T. Riblett and John W. Hodge, Jr. Rev. June 61, 12p. incl. illus. (Specifications rept. no. 2-61, Revision of Specifications rept. no. 1-61)

Unclassified report

DESCRIPTORS: Amputees, *Amputation stumps, Specifications, *Prosthetics, Construction, Design, *Hands, Gloves, Control systems, Military requirements, Test methods, Wire, Operation, *Standards.

AD-258 788 Div. 16, 29
(30 June 61) OTS price $1.60

North Carolina U. School of Medicine, Chapel Hill.
THE EFFECTS AND CHARACTERISTICS OF INCREASED RESPIRATORY DEAD SPACE IN DOGS,
by Thomas B. Barnett and Richard M. Peters. Rept. on Physiology Research. Dec 60, 10p. incl. illus. table.
(Contract AF 33(616)6261, Proj. 7163)
(WADD TR 60-660) Unclassified report

DESCRIPTORS: Anoxia, *Physiology, Dogs, Analysis, Breathing masks, Plastic tubing, Vinyl radicals, Instrumentation, Gas flow, Measurement, *Oxygen consumption, Volume, *Respiration, Carbon dioxide, Time, Lungs, Oxygen masks, Nitrogen, Air.

Artificial breathing apparatus such as oxygen masks involves added external respiratory dead space. In dogs with permanent tracheostomies, chronic increase in dead space has been maintained with lengths of 0.75-inch interior diameter vinyl plastic tubing. A dead space of 20-30 cc./kg. is not tolerated for more than hours. The amount of mixing and air streaming within this tubing and in tubing of 0.5-inch interior diameter and 1.5-inch interior diameter was determined. There was very little mixing in the two smaller tubes but, in the large one, the amount of mixing was significant. (Author)

AD-258 802 Div. 16
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
REACTIONS OF RETINAL NEURONS TO LIGHT FLASHES. I. SINGLE FLASHES AND FLASH STIMULI OF VARYING FREQUENCY,
by Otto-Joachim Gruesser and Carmen Rabello, 4 Apr 61, 38p. incl. illus. 62 refs. (Trans. no. MCL-104 of Pflugers Archiv 265:501-525, 1958)
Unclassified report

DESCRIPTORS: *Retina, *Optic nerve, Eye, Cells (Biology), *Nerves, Stimulation, *Light, Optics, Light pulses, Sensory perception, Frequency, *Light adaptation, Dark adaptation, Inhibition, Excitation.

AD-258 838 Div. 16, 12
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SPECTACLES FOR COSMONAUTS (Ochki Dlya Kosmonavtov).
31 Mar 61, 1p. (Trans. no. MCL-852 of Nauka i Zhizn' 10: p. 72, Oct 60).
Unclassified report

DESCRIPTORS: *Astronautics, Solar atmosphere, *Space flight, Cosmic rays, Radiation effects, Man, Radiation tolerance.

AD-258 869 Div. 16
(5 July 61) OTS price $2.60

Oxford U. (Gt. Brit.).
RESEARCH ON THE ANALYSIS OF THE NEURAL MECHANISMS UNDERLYING PERCEPTION,
by David M. Vowies. Final technical summary rept. no. 1, 1 June 58-30 Sep 60. 27 Jan 61, 1v.
(Contract AF 61(052)114)
(AFOSR-638) Unclassified report

DESCRIPTORS: *Nerves, *Nervous system, Analysis, *Sensory perception, Stimulation, Behavior, Visual perception, *Brain, Electric potential, Olfactory thresholds, Insects, Learning.

AD-258 936 Div. 16, 20
(3 July 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE EFFECT OF HIGH PROTEIN DIETS ON RENAL HYPERTROPHY IN RATS FOLLOWING WHOLE-BODY IRRADIATION,
by F. Konishi, V. J. Rosen, and R. W. Brauer. 18 May 61, 18p. incl. illus. tables (Rept. no. NRDL-TR-510)
Unclassified report

DESCRIPTORS: *Diet, *Proteins, X-rays, *Body weight, Kidneys, *Radiation effects, Rats, Histological sections, Growth, Cells (Biology), Metabolism.

The relationship between high protein intake and increase in kidney weight was investigated in rats exposed to a single dose of 375 rad X-irradiation. Attempts were made to characterize the degree of renal hypertrophy and hyperplasia involved by employing irradiation as an inhibitor of cellular proliferation. Rats were fed a high protein diet and exposed to irradiation at various points of the feeding regime. The high protein diet significantly increased kidney weight in all cases but the increase was not influenced by the X-ray dose employed, or time of administration. However, histological studies of the kidneys showed that irradiation reduced the incidences of abnormal tubular hyperplasia. The renal lesions also appeared much earlier than previously reported by other investigators. Rats fed high protein diets appeared to recover body weight loss from the irradiation at a faster rate than those fed a basal diet. A possible mechanism is briefly discussed. (Author)

AD-258 937 Div. 16, 20
(3 July 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE GROWTH AND DIETARY PATTERN OF RATS ON SELF-SELECTION DIETS FOLLOWING WHOLE-BODY IRRADIATION,
by F. Konishi. 22 May 61, 14p. incl. illus. 10 refs. (Rept. no. NRDL-TR-511)
Unclassified report

DESCRIPTORS: *Diet, *Growth, *Body weight, Rats, *Radiation effects, Metabolism, *Food, *Nutrition, Casein, Minerals, Yeasts, Sucrose, Corn, Selection.

The apparent ability of rats to voluntarily select a dietary according to the needs of the body was utilized in a study to detect possible metabolic derangements subsequent to a dose of 375 rad whole-body X-irradiation. The animals were allowed free choice selections of various foodstuffs offered in separate containers and the relative amounts of food intake as well as body weights were measured daily. The majority of the rats were able to select diets adequate enough to support normal growth. Upon irradiation at the level employed, rats fed a basal pre-mixed diet lost significantly more body weight than similarly treated rats selecting their own diet. In

the over-all pattern, the proportion of casein selected progressively increased whereas that of sucrose decreased subsequent to the irradiation. The selections of yeast and corn oil remained essentially the same. On the third day only, after irradiation, the intake of minerals increased to over 5 times the pre-irradiation level . The selection and intake of casein returned to pre-irradiation levels by the third day while the total caloric intake of irradiated rats on basal and self-selected diets returned to normal levels by the 5th day. (Author)

AD-258 940 Div. 16
(3 July 61) OTS price $7.60

Naval School of Aviation Medicine, Pensacola, Fla.
COMPREHENSIVE BIBLIOGRAPHY OF RESEARCH REPORTS ISSUED OVER A NINETEEN-YEAR PERIOD BY THE U. S. NAVAL SCHOOL OF AVIATION MEDICINE,
by Gilbert A. Daniel and Catherine F. Kasparek.
1 May 61, 74p. 772 refs. (Rept. no. 3)
(Proj. no. MR005.13-3001, Subtask 5)
Unclassified report

DESCRIPTORS: *Bibliography, Biochemistry, *Naval medicine, *Aviation medicine, Space medicine.

The 772 reports listed cover many aspects and phases of aviation and space medicine and show the trend which research has taken since formal entrance of the School into the field of research in 1942. (Author)

AD-258 943 Div. 16, 2, 3, 20
(7 July 61) OTS price $3.60

4th Weather Group, Washington, D. C.
SOME ENVIRONMENTAL EFFECTS ON TOXIC HAZARDS.
May 61, 1v. incl. illus. 21 refs. (4th WG Pamphlet no. 105-8-1)
Unclassified report

DESCRIPTORS: Radioactive fall-out, Rocket propellants, Chemicals, *Radiation hazards, Diffusion, Air, *Contamination, *Hazards, *Toxicity, *Meteorology, Meteorological data, Atmosphere.

Potential environmental hazards from radioactive and other diffusible toxic agents and the use of meteorology to help evaluate, understand, and minimize these hazards have become of utmost importance. This pamphlet provides meteorologists with a general description of the environmental effects on such hazards. In particular cases, environmental effects on toxic hazards are extremely complex. Theoretical and empirical studies of atmospheric turbulence and diffusion have provided some insight to solving specific problems. However, detailed diffusion studies are usually required at each geographical site to evaluate and minimize hazards. (Author)

17. METALLURGY

AD-258 352 Div. 17, 22
(26 June 61) OTS price $5.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
MECHANICAL PROPERTIES OF COMMERCIALLY PRODUCED 4330V (Mod + Si) STEEL,
by C. M. Carman and J. Forney. Oct 60, 56p. incl. illus. tables (Rept. no. R-1583)
(Proj. 512-15-018 and TN2-8051)
Unclassified report

DESCRIPTORS: *Steel, *Mechanical properties, Processing, Heat treatment, Temperature, Tensile properties, Microstructure, Recoilless rifles, Bainite, Austenite, *Ordnance steel, Specifications.

The transverse mechanical properties of commercial 4330V (Mod + Si) steel were investigated over the tempering temperature range of 450 to 750 F. The effects of testing temperature on the tensile properties of 4330V (Mod + Si) steel, when tempered at 600 F, were investigated. The lower tensile strength resulting from marquenching was the result of low temperature bainite in the microstructure. It was concluded that: (1) an ultra high-strength steel having a yield strength of 200,000 psi at 0.10% offset can be produced commercially; (2) embrittlement after tempering at 750 F is the result of shifting of third stage tempering embrittlement to a higher tempering temperature by the increased Si content; (3) marquenching does not produce maximum strength; (4) austenite retained in this steel after tempering at 600 F does not have an adverse effect on the mechanical properties; and (5) high temperature tensile properties up to 500 F are suitable for recoilless rifle applications. (Author)

AD-258 378 Div. 17
(29 June 61) OTS price $2.25

Crucible Steel Co. of America, Midland, Pa.
A STUDY ON CONTROLLING HIGH TEMPERATURE OXIDATION OF VANADIUM BASE ALLOYS,
by James D. Klicker and Howard B. Bomberger. Rept. May 59-Sep 60 on Metallic Materials. Feb 61. 79p. incl. illus. tables, 57 refs.
(Contract AF 33(616)6113, Proj. 7351)
(WADD TR 60-405) Unclassified report

DESCRIPTORS: *Vanadium alloys, *Oxidation, Oxidation inhibitors, Alloys, Metallic compounds, Oxides, Coatings, Films, Refractory materials, Refractory coatings, Crystal structure, Hardness, Physical properties, Electrical properties.

Means for inhibiting the rapid oxidation of vanadium alloys were studied. The characteristics of 240 oxide mixtures were studied first to determine those elements whose oxides form refractory oxides with vanadium oxide. Melting points of these mixtures ranged from 1225 to above 2500 F. The most refractory mixtures contained one or more of the following oxides: Al_2O_3, Nb_2O_3, CrO_3, NiO_2, TiO_2, Y_2O_3, ZrO_2. Twenty-eight of the more refractory oxides were then applied to vanadium sheet but they appeared to offer little protection as coatings. Seventy laboratory-size alloy ingots were cast, processed, and tested for oxidation resistance. Vanadium alloys containing Ti, Al and Ni yielded the most refractory scales; and, oxide melting points as high as 1950 F were observed. Some of the more promising compositions could be hot worked by rolling and extruding. (Author)

AD-258 399 Div. 17
(22 June 61) OTS price $6.60

Armour Research Foundation, Chicago, Ill.
A STUDY OF STRESS-INDUCED DELAYED FAILURE IN HIGH-STRENGTH BRASSES,
by F. A. Crossley and Charles R. Simcoe. Final rept., 1 Oct 59-30 Sep 60. 10 Nov 60, 1v. incl. illus. tables. (Rept. no. ARF 2159-8)
(Contract NObs-77020)
Unclassified report

DESCRIPTORS: *Brass, Fracture (Mechanics), Stresses, *Failure (Mechanics), Manganese alloys, Zinc, Corrosion, Corrosive liquids, Corrosive gases, Salts, Sodium compounds, Chlorides, Grains (Metallurgy), Water, Tensile properties, Mechanical properties, Rupture, Heat treatment, Temperature, Cooling, Solutions, Sea water.

The most important factor in the delayed failure of SAE 430B manganese bronze appeared to be the effects of rapid cooling from high temperatures. Sensitivity to this factor appears to increase with increasing Zn equivalence when composition variation is considered. Coarse grain size also appears to increase sensitivity. The alloy is notch sensitive. In the course of dynamic tensile tests cracks opened up on the surface. At temperatures of 25 and 90 C, water promoted the propagation of these cracks to failure in all of the material conditions tested. At 90 C, salt solution promoted crack propagation in all of the material conditions; but at 25 C, crack propagation was facilitated only in the coarse-grained, high temperature quenched material. Comparison of the results from dynamic and static tensile tests suggests that the aqueous media have influence on two factors: (1) the strain requirement for crack initiation at the surface and (2) the energy requirement for crack propagation. (Author)

AD-258 461 Div. 17
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
POWDER METALS FROM IRON AND STEEL (Metallikeramika Iz Zheleza I Stali)
by S. A. Tsukerman. 31 Oct 60, 9p. incl. illus. table (Trans. no. MCL-469 from Vestnik Akademii Nauk 9:42-46, 1959)
Unclassified report

DESCRIPTORS: USSR, *Powder metallurgy, *Powder metals, Preparation, Production, Iron compounds, Oxides, Reduction, Cast iron, Mechanical properties, Porous metals, Bearings, Steel, Iron, Piston rings, Gears, Oil filters, Powder alloys.

The introduction of progressive methods of powder metallurgy into Soviet industry will economize on 100,000 tons of nonferrons and ferrons metals, appreciably cut down production losses, substantially increase labor productivity in machine-construction factories, improve the quality of the output and lower the cost of production. In addition, the use of this method will free thousands of machine tool units and other equipment in metalworking and finishing shops. (Author)

Division 17 - METALLURGY

AD-258 463 Div. 17
(21 June 61) OTS price $15.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PRODUCTION AND TREATMENT OF STEEL AND ALLOYS, SYMPOSIUM 38 (Proizvodstvo I Obrabotka Stali I Splavov Sbornik XXXVIII).
Nov 60, 227p. incl. tables. (Trans. no. MCL-595 from Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Literatury Po Chernoy I Tsvetnoy Metallurgii, Moskva: pp. 5-195; 209-244, 405-419; 433-583, 1958).
Unclassified report

DESCRIPTORS: USSR, *Symposia, *Steel, *Alloys, Processing, Ores, Minerals, Melting, Reduction, Purification, Heat transfer, Metallurgy, Metals, Industrial equipment, Carbon, Oxygen, Production, Steel industry.

CONTENTS: The effect of the physical structure of agglomerates on their metallurgical characteristics; Investigation of the mineralogical composition of fluxed agglomerates of Krivoy Rog iron ores; Kinetics of carbon oxidation in steel refining; Initial temperatures of the reduction of metal oxides by solid carbon; Decarburization in open-hearth melting of high-phosphorus pig iron; Heat absorption of an open hearth bath during melting as a basis for thermal work control; Viscosity and electrical properties of liquid binary alloys; Heat exchange in the bath of an electric-arc furnace; and The flow of metal and the temperature equalization by the use of electromagnetic stirring.

AD-258 464 Div. 17
(21 June 61) OTS price $16.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FUNDAMENTALS OF STEEL ALLOYING (SELECTED PARTS) (Osnovy Legirovaniya Stali),
by V. S. Mes'kin. Feb 61, 247p. incl. illus. tables (Trans. no. MCL-659 from Metallurgizdat, Moscow: pp. 382-388, 495-579, 589-652, 1959)
Unclassified report

DESCRIPTORS: USSR, *Steel, Stainless steel, Heat resistant alloys, Corrosion resistant alloys, Alloys, Nickel alloys, Cobalt alloys, Austenite, Martensite, Pearlite, Mechanical properties, Physical properties, Crystal structure.

CONTENTS: Effect of alloying on weldability. ALLOYING OF HEAT-RESISTANT AND THERMALLY STABLE STEEL: The role of alloying and other factors in increasing the corrosion resistance and thermal stability of steel; Pearlitic and ferritic-martensitic thermally stable steels; Austenitic heat-resistant steels; Heat-resistant Ni- and Co-based alloys; and Heat-resistant alloys based on high melting metals and special materials; ALLOYING OF STAINLESS AND ACID-RESISTANT STEEL: The role of alloying in increasing the total corrosion resistance; Intercrystalline corrosion of stainless and acid-resistant steels; The effects of alloying and other factors on the mechanical properties of stainless and acid-resistant steels; and alloying of stainless and acid-resistant steels with the aim of improving their technological properties.

AD-258 465 Div. 17, 25
(21 June 61) OTS price $11.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF DISLOCATION IN METALS AND ITS APPLICATION,
by I. A. Oding. 21 Mar 61, 151p. incl. tables, 49 refs. (Trans. no. MCL-624 from Teoriya Dislokatsii V Metallakh I Yeye Primeneniye, Izdatel'stvo Akademii Nauk SSSR, 83p., 1959).
Unclassified report

DESCRIPTORS: USSR, *Metals, *Crystal structure, *Deformation, Lattices, Theory, Stresses, Aging, Brittle materials, Internal friction, Elasticity, Fatigue (Mechanics), Creep, Phase transitions, Mechanical properties, Plasticity, Hardness.

THEORY OF DISLOCATION: Types of imperfections in the crystal lattice, Types (structure) of dislocations, Movement of dislocations, Stress field and dislocation energy, Forces acting on the dislocations, Formation of dislocations, Intersection of dislocations, Dislocation reactions, and Actual resistance to dislocation movement. EXAMPLES OF THE APPLICATION OF THE THEORY OF DISLOCATION: Elastic limit, Yield-point elongation and peak, Mechanical aging, Blue brittleness in steel, Hardening and the stress-strain diagram, Internal friction, Metal fatigue, Creep in metals, Long-term strength of metals, New principles in improving strength, The role of dislocations in phase transformations and structural changes, Brittle failure, and Methods of viewing dislocations and determining the dislocation density.

AD-258 466 Div. 17
(21 June 61) OTS price $9.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEWS OF THE ACADEMY OF SCIENCES USSR, DEPARTMENT OF TECHNICAL SCIENCES METALLURGY AND FUEL (SELECTED ARTICLES).
17 Feb 61, 105p. incl. illus. tables, 71 refs. (Trans. no. MCL-625 from Izvestiya Akademii Nauk, SSSR Otdeleniye Tekhnicheskikh Nauk Metallurgiya I Toplivo 4:pp. 73-81, 106-110, 130-147, 190-199, 202-204, 1959)
Unclassified report

DESCRIPTORS: USSR, *Metals, Stresses, Mechanical properties, Theory, *Nickel alloys, Creep, Hardness, Powder alloys, *Powder metallurgy, Magnetic alloys, Powder metals, *Metallurgy, *Alloys, Titanium compounds, Silicides, Intermetallic compounds, Crystal structure, Plasticity, Phase studies, Sintering, Ferromagnetic materials, Magnets, Heat resistant alloys.

Contents:
On the accuracy of parametric dependences of long lasting strength
Examination into high-temperature creep of nickelic solid solutions by hot-hardness method
Manufacture and properties of ceramet ferro-nickel-alluminum magnets
Thin Fe powder base permanent magnets
Powder metallurgy as a method of manufacturing and searching for magnetic solid materials
Some regularities in sintering of powders of refractory compounds by hot pressing
Some questions in heat-resistance theory and development of new high-strength Ti alloys
Concerning plasticity of Ti silicides

AD-258 467 Div. 17
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LASTING STRENGTH OF BOILER STEEL UNDER VARIABLE

TEMPERATURE CONDITIONS (Dlitel'naya Prochnost' Korel'nykh Staley V Usloviyakh Pererennykh Temperatur),
by I. N. Laguntsov and L. I. Fedotova. 9 Dec 60, 11p. incl. tables (Trans. no. MCL-642 from Teploenergetika 9:57-62, Sep 59).
Unclassified report

DESCRIPTORS: USSR, *Steel, Boilers, Boiler tubes, Mechanical properties, Chemical properties, Heat treatment, Thermal stresses, Tests, *Fatigue (Mechanics), Temperature, Life expectancy, Determination, Test methods, Creep.

AD-258 474 Div. 17
(21 June 61) OTS price $13.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HANDBOOK OF MACHINE BUILDING MATERIALS,
by G. I. Pogodina-Alekseyev. 8 Feb 61, 190p. incl. illus. (Trans. no. MCL-722 from Spravochnik Po Mashinostroitel'nym Materialam 1:678-769, 1959)
Unclassified report

DESCRIPTORS: USSR, *Handbooks, Machines, *Materials, *Heat resistant alloys, *Steel, *Stainless steel, Chromium alloys, Cobalt alloys, Molybdenum alloys, Nickel alloys, Titanium alloys, Industrial equipment, Physical properties, Alloys, Corrosion resistant alloys, Oxidation, Magnetic alloys, Manganese alloys, Silicon alloys, Tungsten alloys, Grains (Metallurgy), Copper alloys, Magnetic materials, Austenite, Mechanical properties, Heat treatment, Corrosion.

AD-258 552 Div. 17
(23 June 61) OTS price $6.60

Institute of Aerophysics, U. of Toronto (Canada).
SYSTEMATIC AXIAL LOAD FATIGUE TESTS USING UNNOTCHED ALUMINUM ALLOY 2024-T4 EXTRUDED BAR SPECIMENS,
by S. R. Swanson. May 60, 12p. illus. tables (UTIA technical note no. 35)
(Contract AF 49(638)548)
(AFOSR-344)
Unclassified report

DESCRIPTORS: *Aluminum alloys, Stresses, *Fatigue (Mechanics), Statistical analysis, Tensile properties, Vibration mechanisms, Test methods, Test equipment, Extrusion, Load distribution.

A series of axial-load fatigue tests were performed on Al Alloy 2024-T4 extruded bar, using a mean tensile stress of 16 ksi. The basic single-level SN relation was established using 9 specimens at each of 15 alternating stress amplitudes. The statistical behavior of the single-level fatigue endurances at the knee of the SN curve was discovered to be consistent with the rise and decay respectively of 2 endurance distributions, apparently representing the action of 2 different fatigue mechanisms. The log-endurance population during transition became bimodal in nature, with the first distribution a continuation of the log normal distributions at stress amplitudes above this region. An extensive 2-level test program was carried out. By this procedure, areas of severe damage accumulation were delineated, as were areas of so-called healing which occur at certain high stress levels (0.1% proof stress), and at high numbers of cycles at low stress levels. (Author)

AD-258 565 Div. 17
(27 June 61) OTS price $2.50

Martin Co., Baltimore, Md.
EXPERIMENTATION, ANALYSIS AND PREDICTION FOR ENVIRONMENTAL CREEP,
by C. J. Giemza. Final rept. May 59-Nov 60. Jan 61, 94p. incl. illus. tables, 35 refs.
(Contract AF 33(616)6453, Proj. 7351)
(WADD TR 60-777)
Unclassified report

DESCRIPTORS: *Aluminum alloys, *Creep, Time, Temperature, Stresses, Load distribution, Test methods, Deformation, Aging, Hardening, Tensile properties, *Sheets, Test equipment, Tests.

An investigation was made of experimental means for characterizing the creep behavior of an Al alloy (7075-T6) for a simple environment during which metallurgical changes would occur, and of means for predicting the behavior under an arbitrary time-temperature-stress environment. Slight overaging (a strength loss of 5%) greatly magnified the environmental creep rate. A recovery mechanism was also observed. A transient creep stage was manifested for each reapplication of load which diminished for subsequent cycles and combinations of either high stress and high temperature or low stress and low temperature. Excellent reproducibility of an arbitrary test environment was possible when the repeat test specimens were selected from adjoining positions in the sheet. A method was developed that made possible the prediction of environmental creep behavior for an arbitrary test condition during which overaging at 350 F took place and, subsequently, when creep resistance was restored as the result of some aging mechanism.

AD-258 568 Div. 17, 27
(26 June 61) OTS price $2.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
STRESS CORROSION OF HIGH STRENGTH STEELS AND ALLOYS. ARTIFICIAL ENVIRONMENT,
by H. L. Anthony, C. J. Owen, and others. Monthly scientific progress rept. no. 11 for May 61. May 61, 26p. incl. tables.
(Contract DA 36-034-ORD-3277)
Unclassified report

DESCRIPTORS: *Steel, *Heat resistant alloys, Rocket cases, Materials, *Corrosion research, Corrosion, Corrosive gases, Corrosive liquids, Heat treatment, Stresses, Cobalt alloys, Alloys, Titanium alloys, Physical properties, Sheets, Atmosphere.

Cumulative U-bend and bent beam stress corrosion test results on selected high strength missile steels and alloys are presented. The materials under test include AM355, PH15-7 Mo, B120 VCA, Vascojet 1000, 300M, D6Ac, 4137 Co, Rocoloy 270, and Ardeform 301. Physical properties of as-received primary heats of PH15-7 Mo, 300M, and Rocoloy 270 are presented in addition to the heat treat survey data for PH15-7 Mo. (Author)

AD-258 588 Div. 17
(27 June 61) OTS price $2.25

Reactive Metals, Inc., Niles, Ohio.
A STUDY OF THE EFFECT OF ELECTRON BEAM MELTING

ON COMPOUNDS AND METALS,
by R. L. Martin, S. R. Seagle, and O. Bertea.
Rept. for Apr 58-July 60 on Metallic Materials.
Jan 61, 79p. incl. illus, tables.
(Contract AF 33(616)5603, Proj. 7317)
(WADD TR 60-404) Unclassified report

DESCRIPTORS: *Metals *Metallic compounds, *Melting, *Electron beams, Electron bombardment, Boron, Boron alloys, Carbon alloys, Tantalum compounds, Carbides, Titanium compounds, Zirconium compounds, Silicon alloys, Borides, Beryllium, Cobalt, Hafnium, Molybdenum, Tungsten, Vanadium, Deoxidation, Tensile properties, Hardness, Microstructure, Purification.

A study was made of the effect of the electron beam melting process on B, B-C alloys, B-Si alloys, TaC, TiC, ZrB2, Hf, W, Co, V, and Be. In addition, deoxidation studies were carried out on Be, V, Co and Mo. When possible, microstructures, tensile properties, and chemical compositions of the materials melted were obtained. The compounds studied either could not be melted or were brittle after melting. The interstitial content of all the metals was reduced by the electron beam melting process. By the addition of deoxidants, the interstitial contents of Mo and Be were reduced. Improvement in the tensile properties of V and Mo were obtained by the addition of deoxidants. (Author)

AD-258 621 Div. 17, 25
(28 June 61) OTS price $6.60

Illinois U. Engineering Experiment Station, Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART IV. THE BEHAVIOR OF BEAM-COLUMNS IN THE INELASTIC RANGE,
by B. B. Muvdi and O. M. Sidebottom. Rept. for 1 Oct 60-31 Sep 61. Apr 61, 60p. incl. illus. tables, 22 refs. (T&AM rept. no. 183)
(Contract AF 33(616)7600, Proj. 7351)
(WADD TR 60-580, pt. 4) Unclassified report

DESCRIPTORS: *Beams, Design, Theory, Moments, Load distribution, Stresses, Deformation, Deflection, Elasticity, Aluminum alloys, Stainless steel, Steel, Buckling, Mathematical analysis, Tests, Structures, Mechanics, Failure (Mechanics), Materials.

Two theories were presented for constructing either moment-load or load-deflection relations as well as the collapse loads for beam-columns. In each case, trial and error solutions were required which used constant depth of yielding interaction curves. A so called exact theory was presented which gave results as accurate as desired; however, the theory was not practical because of the excessive time required. An approximate theory was presented which gave results in close agreement with the exact theory and with experimental data. This theory required the elastic solution for maximum elastic conditions. The experimental part of the investigation included tests of rectangular - and T-section columns made of 2024-T4 aluminum alloy, SAE 1020 steel, and 17-7PH stainless steel. Several slenderness ratios were considered. In addition to the variable axial load, the columns were subjected to a constant transverse load either at midspan or at quarter span. (Author)

AD-258 622 Div. 17, 25
(28 June 61) OTS price $6.60

Illinois U. Engineering Experiment Station, Urbana.
INELASTIC BUCKLING OF COLUMNS WITH ELASTICALLY RESTRAINED ENDS,
by William H. Collins and Omar M. Sidebottom. June 61, 58p. incl. illus. tables, 30 refs. (T&AM rept. no. 192)
Unclassified report

DESCRIPTORS: *Beams, Buckling, Mechanics, Design, Theory, Mathematical analysis, Tests, Aluminum alloys, Stresses, Deflection, Deformation, Load distribution, Moments, Structures, Materials, Elasticity, Failure (Mechanics).

Two methods were presented for constructing curves showing the relationship between average stress and deflection at the central section for columns with elastically restrained ends. Both methods used constant depth of yielding interaction curves, but differed in the assumptions pertaining to the shape of the deflected column. One method assumed that the deflected shape was that of a sine curve. A more exact method divided the column length into several equal segments over which the curvature was assumed to be constant. For the latter method, a digital computer solution was presented. The experimental portion of the investigation involved the testing of twenty 2024-T4 aluminum alloy columns. Two slenderness ratios, 75 and 50, were considered, and axial loads were applied at eccentricities ranging from 5 to 50% of the cross sectional height. Four of the columns were tested with a concentrated lateral load at the central section in addition to the axial load. (Author)

AD-258 633 Div. 17, 25
(28 June 61) OTS price $4.60

Materials Research Lab., U. of Calif., Berkeley.
ON THE NATURE OF STRAIN HARDENING IN FACE-CENTERED-CUBIC METALS,
by P. W. Osborne, S. K. Mitra, and J. E. Dorn. 4 May 61, 40p. incl. illus. tables, 14 refs. (Technical rept. no. 10; Series no. 103, Issue no. 10)
(Contract Nonr-22249)
Unclassified report

DESCRIPTORS: *Single crystals, *Metallic crystals, *Hardening, Deformation, Tensile properties, Stresses, Creep, Crystal structure, Lattices, Tests, Shear stresses, Theory, Analysis.

The low temperature tensile and creep behaviors of single crystals of Cu were evaluated and analyzed in such a manner as to provide an estimate of the separate contributions of short and long range stress fields to strain-hardening. Furthermore, the average force-displacement diagram for thermally activated intersection of two dislocations was established. This diagram plus a knowledge of the variation of dislocation spacing and the long-range back stresses with strain permits an accurate prediction of creep rates. The calculated activation energy for intersection under conditions of a constant strain rate increases linearly with the absolute temperature as required by theory. (Author)

AD-258 684 Div. 17
(28 June 61) OTS price $2.60

Watertown Arsenal Labs., Mass.
TENSILE STRENGTH-HARDNESS CORRELATION FOR TITANIUM ALLOYS,
by Charles F. Hickey, Jr. Technical rept. on Industrial Preparedness Measure. Product Improvement. Apr 61, 21p. incl. illus. tables (Rept. no. WAL TR 405.22/1)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Tensile properties, *Hardness, Heat treatment, Temperature, Tests, Test equipment, Aluminum alloys, Chromium alloys, Molybdenum alloys, Vanadium alloys, Statistical analysis.

The establishment of a correlation between tensile strength and hardness for Ti alloys was attempted. Materials of current interest were considered and tested over a fairly wide property range. Tensile and hardness properties were obtained as a function of testing temperature, heat treatment, and section size of material. Data were also obtained from a literature survey. As a result of the findings, a correlation was established between tensile strength and hardness for stable alpha-beta alloys. It does not apply for metastable alpha-beta alloys nor does it adequately define data in all-beta alloys. In addition, a hardness correlation was established between Vickers and Rockwell C for the stable alpha-beta alloys. (Author)

AD-258 764 Div. 17
(29 June 61) OTS price $1.10

Oxford U. (Gt. Brit.).
RESEARCH ON THE FREEZING AND MELTING POINTS OF IRON ALLOYS,
by W. Hume-Rothery. Quarterly technical status rept. no. 15, 1 Feb-30 Apr 61. 30 Apr 61, 2p.
(Contract AF 61(514)1062)
Unclassified report

DESCRIPTORS: *Iron alloys, *Phase studies, Melting, Freezing, Phase transitions, *Transition temperature, Determination, Test methods, Chemical analysis, Carbon alloys, Nickel alloys, Iridium alloys, Osmium compounds.

Progress is reported on the development of phase diagrams for Fe-C-Ni, Fe-Ir, and Fe-Os alloys. Effort is being directed toward refinement of electron-probe microanalysis techniques for the determination of Ni in quenched phases of Fe-C-Ni alloys. The thermal analysis of the Fe-rich portion of the Fe-Ir system is complete; the peritectic transformation occurs at 1538 C. Seven alloys were prepared in the Fe-Os system. The Fe-rich end of the phase diagram is similar to that of Fe-Ir. The peritectic transformation takes place at 1550 C.

AD-258 793 Div. 17
(30 June 61) OTS price $6.60.

Case Inst. of Tech., Cleveland, Ohio.
AN INVESTIGATION ON DEVELOPMENT OF AS-CAST GRAIN REFINER FOR CAST STEEL,
by G. K. Turnbull, G. W. Form, and J. F. Wallace. Final technical rept. 25 Sep 58-30 Apr 60. Dec 60, 1v. incl. illus. tables, 41 refs.
(Contract DA 33-019-505-ORD-10; In cooperation with Rodman Lab., Watertown Arsenal, Mass.)
(WAL TR 311/48) Unclassified report

DESCRIPTORS: *Cast steel, Grains (Metallurgy), Crystal structure, Microstructure, Additives, Crystallization, Transformations, *Processing, Steel castings, Mechanical properties, Steel, Growth, Nucleation, Titanium, Titanium compounds, Carbides, Niobium, Vanadium, Boron.

Various substances were added to molten low carbon steel in an attempt to develop methods by which the as-cast structure of steel could be grain-refined. The selection of the additions was based either on their capability to provide finely distributed centers for heterogeneous nucleation or on their potency of producing appreciable constitutional supercooling to interrupt continuous growth of the first formed crystallites. Considerable effort was directed toward developing suitable means of delineating the as-cast grain size from various structural features which persisted through the allotropic transformation when cooling to room temperature. As inoculants, TiC and V-B were particularly effective, while Nb and Ti proved to be suitable solute additions to interrupt grain growth. Mechanical properties were determined for those castings in which appreciable grain refinement of the as-cast structure was obtained. Generally, an improvement in strength was obtained which, however, was accompanied by a loss in ductility and notch toughness. (Author)

AD-258 803 Div. 17
(29 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CORROSION RESISTANT TITANIUM AND ITS ALLOYS,
by I. I. Kornilov. 8 Mar 61, 19p. incl. illus. tables, 23 refs. (Trans. no. MCL-140 of Khimicheskaya Nauka i Promyshlennost 3:803-807, 1958)
Unclassified report

DESCRIPTORS: *Corrosion resistant alloys, *Titanium, *Titanium alloys, Corrosion research, Corrosive gases, Corrosive liquids, Oxidation, Combustion, Chemical reactions, Mechanical properties, Electrical properties, Physical properties, USSR.

AD-258 811 Div. 17
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PHYSICS OF METALS AND METAL WORKING (SELECTED ARTICLES) (Fizika Metallov I Metallovedeniye). Apr 60, 23p. incl. tables, 18 refs. (Trans. no. MCL-494 of Metallurgizdat Sverdlovsk 8:pp. 595-598, 622-630, Oct 59).
Unclassified report

DESCRIPTORS: USSR, Metallurgy, Phase studies, *Nickel alloys, *Carbon alloys, Eutectics, *Metallic compounds, Transition elements, Borides, Carbides, Nitrides, Silcides, Hardness, Microstructure, Crystal structure, Lattices, Brittle materials, Measurement.

Contents:
The carbide eutectic in nickel-carbon alloys, by R. A. Sidorenko
Hardness and brittleness of metal-like compounds, by G. V. Samsonov, V. S. Neshpor and L. M. Khrenova

AD-258 815 Div. 17
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NON-EQUILIBRIUM STATE AND DIFFUSION CREEP IN CERAMET BODIES,
by B. Ya. Pines and A. F. Sirenko. 21 Mar 61, 34p. 11 refs. (Trans. no. MCL-592 of Fizika Metallov i Metallovedeniye 8:pp. 766-776, 1959)
Unclassified report

DESCRIPTORS: USSR, *Powder metallurgy, Powder alloys, *Powder metals, *Creep, Diffusion, Theory, Deformation, Stresses, Time, Heat treatment, Lattices, Crystal structure, Sintering.

Powder compacts of Cu, Ni, and Fe, and a mixture of these powders at initial porosities of 30 to 32% were subjected to tensile creep at temperatures up to 1250 C in a vacuum. The observed elongations were plotted as a function of time for various durations of time under isothermal conditions(1000 C) at a constant load (10 g/sq mm). For pure Cu powders, the initial strain rate as well as the total deformation in creep decreased as the duration of preliminary annealing was increased. For a 50/50 mixture of Cu and Ni powders, the initial (15 min or less) strain rate showed an increase which is postulated to result from a large quantity of excess vacancies because of the inequality of the partial diffusion coefficients of Cu and Ni, When the duration of preliminary annealing was prolonged (more than 1 hr), the creep strain of the mixture was reduced and became smaller than that of pure Cu. Specimens with different initial porosities had different initial creep rates, but after annealing the creep rates became identical.

AD-258 816 Div. 17, 25
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DISTRIBUTION OF STRAINS AND STRESSES IN FLAT NOTCHED BARS ASSOCIATED WITH A THREE-DIMENSIONAL STRESSED STATE,
by V. S. Zhukovskiy. 25 Apr 61, 26p. (Trans. no. MCL-610 of Problemy Prochnosti V Mashinostroyenii 2:54-71, 1959)

Unclassified report

DESCRIPTORS: USSR, *Steel, Deformation, Stresses, Test methods, Tensile properties, Metal plates, Sheets, *Elasticity, *Plasticity, Thickness, Load distribution, Fracture (Mechanics), Theory, Mechanical properties.

Deformation was experimentally investigated up to the fracture of plane, deeply notched, elongated bars of various thicknesses made of 45 steel at a stress concentration coefficient in the elastic region of 4.86. A state of plane deformation was shown to exist when the thickness of the specimen was 2.5 to 3 times larger than the width of the notched section. The resistance to deformation and the strength of the specimen was shown to increase during the transition from a state of plane stress to plane deformation. The plastic deformation in the bottom of the notch, hardening, and increase of the radius preceding fracture were of considerable magnitude. Volumetric curves of stresses in the notched section were plotted by zones of fracture and by the approximate solution of the corresponding elastoplastic equations.

AD-258 858 Div. 17
(30 June 61) OTS price $1.60

Chicago Development Corp., Riverdale, Md.
AN INVESTIGATION OF THE MECHANICAL PROPERTIES ON THE METHOD OF ADDITION OF IRON TO ELECTROLYTICALLY PRODUCED TITANIUM,
by R. S. Dean and W. W. Gullett. Final rept. 30 Apr 61, 14p. incl. illus.
(Contract NOw-60-0164-c)

Unclassified report

DESCRIPTORS: *Titanium, Iron, Hardness, Oxygen, Melting, *Processing, *Titanium alloys, Iron alloys, *Ferromagnetic materials, Magnetic properties, Crystal structure, Electrolytic cells, Electrolysis, Additives, Microstructure, Mechanical properties.

Iron introduced into electrolytic Ti crystals during electrolysis did not increase the hardness of the crystals but had a large effect on button hardness. A combination of Fe and O introduced by melting showed only a slight variation in hardness from an additive relationship, Fe lowered the hardening effect of O in the range of 0.3 to 0.4% Fe. The amount of intrinsic Fe present was reflected most accurately in the remanent magnetism of the alloys at high fields. The results indicate that the remanent magnetism of button samples is affected by O added on melting in the same way as hardness. Metallographic examination of samples with high remanent magnetism showed a typical basket weave structure indicating a precipitation on preferred lattice planes. The unusual structure and properties of the cast samples with high intrinsic Fe were obliterated by hot work. The cold worked samples showed a load-elongation curve indicating an increased apparent modulus within the elastic range. (Author)

AD-259 012 Div. 17, 26
(5 July 61) OTS price $3.60

Fansteel Metallurgical Corp., North Chicago, Ill.
TUNGSTEN SHEET ROLLING PROGRAM,
by George C. Bodine, Jr. Interim rept. no. 5, 1 Mar-30 Apr 61. 18 May 61, 25p. incl. illus. tables.
(Contract NOw-60-0621-c)

Unclassified report

DESCRIPTORS: *Tungsten, *Sheets, Rolling mills, *Powder metals, Powder metallurgy, Processing, Production, Sintering, Manufacturing methods, Heat treatment, Grains (Metallurgy), Microstructure, Mechanical properties.

Large sintered sheet bars of W were prepared and processed to obtain more data for the detailed planning of the sheet processing evaluation phase. Comprehensive work outlines have been prepared for the sheet processing evaluation. A tentative powder purchase specification was prepared and both undoped and 1% ThO2 W powders were ordered for use in the next phase of the program. (Author)

AD-259 028 Div. 17, 14, 26
(5 July 61) OTS price $15.00

General Electric Co., Cincinnati, Ohio.
PROTECTIVE COATINGS FOR MOLYBDENUM ALLOYS,
by J. W. Graham and W. B. Hall. Summary rept. 20 Mar 59-20 Mar 60. 31 Mar 60, 119p. incl. illus. tables (Rept. no. R60FPD307)
(Contract NOa(s) 59-6026-c)

Unclassified report

DESCRIPTORS: *Molybdenum alloys, Coatings, Metal coatings, *Refractory coatings, Ceramic coatings, Flame spraying, Electric arcs, Plasma jets, Turbine blades, Tests, Thermal stresses, Failure (Mechanics), Impact shock, Bonding, Elasticity, Adhesion, Hardness, Phase studies, Oxidation, Surface tension, X-ray diffraction analysis, Diffusion.

Two Mo coating tasks were studied. One involved an investigation of four commercial coatings at a 2200 F by thermal shock, flexure and impact

tests. A thorough analysis was made of the coating failures, based on fundamental relationships of the coating and base materials, their process parameters, and thermal stress differentials. The relative merit of the coating life at 2200 F was established by relating the consistency of test life to the crack frequency which occurred during testing. The second task involved the study of fundamental relationships existing in an approach to infiltrate refractory glasses into flame sprayed oxide coatings on Mo and on Nb and Ta bond coats deposited on Mo by arc and plasma spraying and vacuum sputtering. Studies were made on coating reactivity with base metal, surface tension, elastic differential stress, and metallic oxidation and diffusion. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-258 469 Div. 18, 12, 22, 31
(21 June 61) OTS price $8.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW DEVELOPMENTS IN MILITARY EQUIPMENT (SELECTED ARTICLES) (Novoye V. Voyennoy Tekhnike).
Feb 61, 85p. incl. illus. table (Trans. no. MCL-650 from Voyennoye Izdatel'stvo Ministerstva Oborony Soyuza SSSR, Moscow: pp. 27-33, 161-214, 372-380, 1958)

Unclassified report

DESCRIPTORS: *Warfare, Guided missiles, Design, *Nuclear warheads, Shipyards, Artillery, Weapons, Guidance, Detection, *Military operations, *Guided missile warheads, Ships, Construction, *Torpedoes, Mines, Naval operations, Amphibious operations, *Submarine warfare.

Contents:
Guided missiles as carriers of nuclear warheads, by V. Tyurnin
The development of naval materiel, by N. Gordeyev
Military shipbuilding, by L. Vladimirskiy
Ship-based artillery, by A. Katkov and D. Solov'yev
Mine and torpedo weapons, by V. Romanovskiy
Landing means, by A. Ashenkov
Rocket weapons and combat operations at sea, by L. Vladimirskiy
Guidance method of the shipborne missile Terrier, by B. Surikov
Ship gas turbines, by G. Zotikov
Technique of underwater detection, by Yu. Sergeyev

AD-258 640 Div. 18, 2
(28 June 61) OTS price $5.60

Army Electronic Proving Ground, Fort Huachuca, Ariz.
SIGNAL CORPS OPERATIONAL METEOROLOGICAL SUPPORT TO U.S. ARMY RESEARCH AND DEVELOPMENT ACTIVITIES DURING FISCAL YEAR 60.
Dec 60, 54p. incl. illus. tables (Rept. no. AEPG-SIG 970-32)
(Proj. 66-0000)

Unclassified report

DESCRIPTORS: Military research, *Meteorology, *Military requirements, Weather stations, Operation, Analysis, Research program administration.

19. NAVIGATION

AD-258 882 Div. 19, 1
(3 July 61) OTS price $2.60

Aberdeen Proving Ground, Md.
ROAD SHOCK AND VIBRATION TEST OF FLIGHT CONTROL SYSTEM, SURVEILLANCE AIRCRAFT, AN/UPW-1 (XE-1), by Y. Kamita. June 61, 1v. incl. illus. tables. (Rept. no. DPS-262)

Unclassified report

DESCRIPTORS: *Control systems, *Remote control systems, Flight, Aerial reconnaissance, Aircraft, *Radar equipment, Tests, Test methods, Radar antennas, Antenna masts, Acceleration, Roads, *Radar trailers, Impact shock, *Surveillance drones, Vibration, Stability.

An engineering model of the flight control system, AN/UPW-1 mounted on an M103A3 trailer was subjected to road shock and vibration tests to determine the stability and operating characteristics of the trailer on the various courses, the ability of the system to withstand the shock and vibration, and the acceleration levels as measured at the antenna mounting platform. Operation and stability of the trailer on the various courses at the speeds tested was satisfactory. The system withstood the shock and vibration environment to which it was subjected. Maximum acceleration measured on the antenna platform was between 4 and 5 g and was transient in nature. Shortcomings noted during the test were wear (chafing) of a nylon tie-down strap used to secure on-board equipment, and loosening of the antenna travel lock pin during transportation. (Author)

AD-258 902 Div. 19, 2
(3 July 61) OTS price $1.60

Geophysics Corp. of America, Boston, Mass.
INTERPLANETARY NAVIGATION STUDIES: LIGHT CENTERS OF TERRESTRIAL PLANETS,
by G. de Vaucouleurs. June 61, 14p. incl. illus. tables (GCA Technical rept. no. 61-25-A)
(Contract AF 33(616)7413; In cooperation with Texas U., Austin)

Unclassified report

DESCRIPTORS: *Planets, *Space navigation, *Light communication systems, Space flight, *Venus, Solar systems, Celestial navigation.

PHASE SHIFT FOR A LAMBERT SPHERE: A theoretical estimate is made of the differences in direction between an observer and a light center of a planet when the phase angle is not zero. The Lambert sphere is a sphere whose surface is a perfect diffusor; it is the simplest model of reflection by a planet. For actual planets, the phase functions decrease much faster away from full phase than for a Lambert sphere. When the phase angle approaches 180 degrees, the actual planets will depart from the Lambert sphere in different directions according to the nature of the reflecting surface. OBSERVED PHASE DEFECTS OF MERCURY AND VENUS: The fractions of the disk illuminated are compared as between computed and observed values. Curves for Venus tend to show the effect of limb darkening at small phase angles and of atmospheric scattering at large phase angles. The curve for Mercury probably reflects

the systematic errors of measurements. LIGHT CENTER OF MERCURY: The observational evidence on the departures between the center of light and the center of mass of mercury is analyzed.

AD-258 903 Div. 19, 2
(3 July 61) OTS price $1.60

Geophysics Corp. of America, Boston, Mass.
ON THE POSSIBILITY OF USING ASTEROIDS AS POSITION INDICATORS IN INTERPLANETARY NAVIGATION,
by R. J. Levy. June 61, 11p. incl. tables (GCA Technical rept. no. 61-27-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: *Space navigation, *Planets, *Spaceships, Earth, Mars, Venus, Light communication systems, Solar systems, Celestial navigation.

Observations of minor planets from an interplanetary vehicle are discussed as a means of obtaining vehicular position information. The accuracy attainable by such means is comparable or superior to that from midcourse observations of planets. Various advantages and difficulties of this procedure are cited. (Author)

AD-258 904 Div. 19, 2, 12
(3 July 61) OTS price $1.60

Geophysics Corp. of America, Boston, Mass.
INTERPLANETARY NAVIGATION STUDIES: THE ENERGY DISTRIBUTION IN STELLAR SPECTRA,
by R. J. Levy. June 61, 9p. incl. tables, 19 refs.
(GCA Technical rept. no. 61-28-A)
(Contract AF 33(616)7413)
Unclassified report

DESCRIPTORS: Space flight, *Space navigation, *Stars, Colors, Temperature, Identification, *Astrophysics, Astronomy, Energy.

The colors of stars may be valuable in finding and identifying those stars which are useful in interplanetary flight. Stellar colors are indicated by color indices, spectral types, or gradients, for which black-body temperatures defined in various ways approximately represent the spectral continuum energy distribution. A table of representative temperatures is given, as well as color information for the brightest stars. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-258 385 Div. 20
(29 June 61) OTS price $9.10

Armour Research Foundation, Chicago, Ill.
RADIATION STREAMING IN SHELTER ENTRANCEWAYS,
by C. W. Terrell, A. J. Jerri and others. Final rept. Oct 60, 95p. incl. illus. tables (Rept. no. ARF 1158-12)
(Contract NBy-3185)
Unclassified report

DESCRIPTORS: Protective coverings, *Shelters, Ducts, Ventilation ducts, Albedo, Theory, *Gamma emission, *Neutrons, Measurement, Neutron flux density, Attenuation, Neutron counters, Concrete, Lead, *Gamma rays, Calibration, Gamma counters, Neutron detectors, Mathematical analysis.

The basic objective of the work reported herein is to study, describe and measure the transport of nuclear radiation through air ducts having walls of different materials. Particular emphasis is placed on full scale concrete ducts which are intended for use as underground shelter entranceways and contain a right angle bend. It is shown that a modified albedo theory will rather accurately describe the transmission of both gammas and neutrons in lead and concrete ducts. Theory is compared with experimental measurements of gamma dose and neutron flux attenuation factors. Neutron number albedo measurements are made and reported. Work by various theorists and experimenters are included for completeness and comparison. This program rather clearly points out direction future programs should take and the areas in which major emphasis is needed. (Author)

AD-258 394 Div. 20, 30
(23 June 61) OTS price $3.60

Stanford U., Calif.
LAMB SHIFT IN THE HELIUM ATOM,
by Charles Schwartz. Apr 60, 28p. incl. tables, 12 refs. (Technical note no. 388-36)
(Contract AF 49(638)388, Proj. 9750-37500)
(AFOSR 661) Unclassified report

DESCRIPTORS: *Helium, *Atoms, *Atomic energy levels, *Excitation, Ionization, Ions, Hydrogen, Mathematical analysis, Corrections, Parity, Integrals, Programming, Digital computers.

The calculation, first attempted by Kabir and Salpeter, (Phys. Rev. 108:1256, 1957), of the mean excitation energy entering in the Lamb shift of the helium ground state is redone by a different approach. The answer, Ln (K(o)/r(y)) equals 4.370 + or - 0.004, leaves theory and experiment on the ionization energy of helium in agreement within the experimental uncertainty of + or - 1/0.15 cm. Incidental results are given for the electrostatic polarizability of He and H(-) ground states; there is appended a new discussion of the construction of higher angular momentum eigenfunctions for the 3-body problem. (Author)

AD-258 417 Div. 20
(22 June 61) OTS price $1.60

University Coll., London (Gt. Brit.)
EVIDENCE FOR PION-PION INTERACTIONS FROM S-WAVE PION-NUCLEON SCATTERING,
by J. Hamilton, P. Menotti and others. Technical scientific note no. 1, 10 Feb 61, 17p. incl. table, 13 refs.
(Contract AF 61(052)468)
(AFOSR-641) Unclassified report

DESCRIPTORS: *Pions, *Nucleons, *Nuclear reactions, Scattering, Spin, Isotopes, Nuclear moments, Nuclear spins, Mathematical analysis.

By fitting the s-wave partial amplitudes for π-N scattering, in an unphysical region, we have

greatly extended the energy range over which we can examine the contribution from the process $\pi + \pi \rightarrow N + \bar{N}$. Our method shows up contributions from this process in states of isotopic spin $T = 0$ and $T = 1$. We can estimate the energies $t^{1/2}$ for which this process is important. The form of these contributions is just what would be expected from considerations of angular momenta. Estimates of the amplitudes for $\pi + \pi \rightarrow N + \bar{N}$ are deduced. The $T = 0$ amplitude is large, but in the $T = 1$ case the amplitude is much smaller than the values which were predicted from the nucleon isovector form factors. (Author)

AD-258 448 Div. 20
(22 June 61) OTS price $1.10

Ecole Normale Superieure (France).
THE PION-PION INTERACTION AND HIGH ENERGY p + d COLLISIONS,
by J. G. Taylor. Jan 61, 5p. 12 refs. (Technical note no. 24)
(Contract AF 61(052)173)
(AFOSR-656) Unclassified report

DESCRIPTORS: *Pions, *Nuclear reactions, *Proton reactions, Protons, *Deuteron reactions, Deuterons, Mesons, Compton scattering, Scattering.

A possible explanation of the anomaly found in meson production in proton-deuteron collisions is that put forward by Tubis and Uretsky (Phys. Rev. Letters. 5:513, 1960). They suggest that if a final state P wave pion-pion interaction, described in the scattering length approximation, is added to the statistical model of Abashian et al. (Ibid., 5:258, 1960), a P wave scattering length of magnitude 2.5 pion Compton wavelengths explains the anomaly. Evidence is given that does not agree with such a large value for this scattering length. This evidence comes from equations relating the three scattering lengths as derived from crossing symmetry, and from the experimental evidence on the asymmetry of the pion momentum spectrum in tau decay. (Author)

AD-258 462 Div. 20
(21 June 61) OTS price $23.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LIQUID-METAL COOLANTS IN NUCLEAR REACTORS (Zhidkometallicheskiye Teplonositeyaye Yadernykh Reaktorov),
by P. A. Andreyev, A. A. Kanayev, and Ye. D. Fedorovich. 1960, 463p. incl. illus. tables (Trans. no. MCL-554 from Leningrad: pp. 2-37, 110-360, 1959).
Unclassified report

DESCRIPTORS: *Liquid metals, *Coolants, *Liquid metal-cooled reactors, *Reactor coolants, Heat transfer, Corrosive liquids, Design, *Nuclear power plants, Corrosion, Fluid flow, Metals, USSR, Alloys, Liquid metal pumps, Liquid metal valves, Impurities.

Information (based on foreign sources) on the properties of liquid metals used as coolants in nuclear reactors is presented. The topics discussed are: (1) heat transfer (in the liquid phase or during boiling and condensation); (2) the interaction of liquid metals with structural materials; (3) methods for removing impurities from liquid metals; and (4) the peculiarities of design and operation of systems with liquid-metal coolants. Requirements to be met by heat-transfer media used in nuclear reactors and ways of raising the efficiency of atomic power plants employing liquid-metal coolants are also discussed. A brief survey is given of some domestic (USSR) research work on liquid metals. (Author)

AD-258 495 Div. 20
(21 June 61) OTS price $17.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NUCLEAR REACTORS,
by Ye. M. Balabanov. 7 Feb 61, 263p. incl. illus. tables (Trans. no. F-TS-9966 from Yadernyye Reaktory, Moscow, 211p. 1957).
Unclassified report

DESCRIPTORS: Research reactors, Nuclear reactions, *Nuclear physics, *Power reactors, Nuclear power plants, *Nuclear energy, Theory, USSR.

Contents:
The physical basis of nuclear processes
The nuclear chain process
Physical processes in nuclear reactors
Research nuclear reactors
Nuclear power engineering
Obtaining and utilizing radioactive substances
Thermonuclear reactions

AD-258 572 Div. 20, 4, 16
(26 June 61) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
OXYGEN CONTAMINANTS. CYLINDER ODORS,
by Roscoe G. Bartlett, Jr., Norman E. Phillips, and Gordon T. Couch. 23 Jan 61, 8p. incl. illus.
(Rept. no. 3)
(Proj. MR005.13-3100)
Unclassified report

DESCRIPTORS: *Oxygen, Contamination, Containers, *Odors, *Oxygen equipment, Olfactory thresholds, Breathing apparatus, Liquefied gases, Aviation personnel, Naval personnel, *Personnel.

Each of a pair of cylinders of aviators' breathing oxygen taken from stock at the Pensacola Naval Air Station was differentiated by olfaction by subjects with high olfactory acuity. Thus, oxygen from any cylinder would be said to have an odor since it is distinguishable by olfaction from other cylinders. Relationships of cylinder odors to bad oxygen episodes are discussed. (Author)

AD-258 669 Div. 20
(28 June 61) OTS price $11.00

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
(No Title).
Progress rept. no. 57 for period ending 31 Oct 60. 1 Nov 60, 143p. incl. illus. tables.
(Contracts NASw-37 and NASw-75)
Unclassified report

DESCRIPTORS: *Nuclear physics, *Particle accelerators, Radiochemistry, Cyclotrons, Cosmic rays, Fission, Nuclear reactions, Radioactivity.

Division 21 - NUCLEAR PROPULSION
Division 22 - ORDNANCE

AD-258 898 Div. 20
(3 July 61) OTS price $9.60

Convair, Fort Worth, Tex.
CALIBRATION OF FOILS FOR NEUTRON FLUX MEASUREMENTS,
by J. R. Bell and J. K. Miles. 6 June 61, 116p. incl. illus. tables, 18 refs. (Doc. no. NARF-61-18T; Rept. no. MR-N-279)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Neutron flux density, Foils, Radiochemistry, *Radioactive decay, Calibration, Measurement, Nuclear reactions, *Radiation counters, Alpha counters, Beta counters, *Radiation damage, Test reactors.

Irradiations were performed in the uniform fluxes of two different experimental facilities. The beta-counting efficiencies of Convair's end-window flow counters were determined for 22 types of Convair foils and three types of Aerojet-General Nucleonics (AGN) foils. Gamma counter efficiencies were also determined for five types of Convair foils and five types of AGN foils. The absolute disintegration rate of each type foil was determined by one or more of the following methods: beta-gamma coincidence counting, 4 pi beta counting, or by relation to a similar foil of known disintegration rate. Neutron fluxes were measured in the wet-pool pneumatic tube and at one location in the irradiation cell. The analytical neutron spectrum of the Ground Test Reactor (GTR) in the pneumatic tube was verified. An intercalibration with AGN was performed in two ways: (1) by Convair determination of disintegration rates of AGN calibrated gold, cobalt, and sulfur foils, and (2) by an AGN determination of the fluxes from gold, cobalt, and sulfur foils. (Author)

AD-258 945 Div. 20
(7 July 61) OTS price $8.10

Convair, Fort Worth, Tex.
TEST ANALYSIS OF THE 3-Mw GROUND TEST REACTOR,
by W. Park. 31 May 61, 80p. incl. illus. tables, 10 refs. (Document no. NARF-61-15T; Rept. no. MR-N-254)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Test reactors, Tests, Heat transfer, Control rods, Instrumentation, Calibration, Ionization chambers, Thermopiles, Xenon, Fuel processing, Heat exchangers, Reactor coolants, Reactor hazards, Shielding.

The instrumentation and reactor frame of the ground test reactor at Convair-Fort Worth was modified in order to increase the power level from 500 kw to 3 mw. A criticality experiment was performed, and the control rods and power-level instrumentation were calibrated. Performance studies were made of the heat-transfer system, control-rod magnets, bypass panel, and the power-level controller. Activation and poison buildup were analyzed. (Author)

AD-259 003 Div. 20, 25
(5 July 61) OTS price $2.60

California U., Berkeley.
CONVERSION OF MUONIUM INTO ANTIMUONIUM,
by G. Feinberg and S. Weinberg. 1961, 22p. (Contracts AF 49(638)327 and Nonr-22260, Proj. NR 041-221; In cooperation with Columbia U.). (AFOSR-782)
Unclassified report

DESCRIPTORS: *Mesons, Electrons, Particles, *Meson scattering, Scattering, Gases, Mathematical analysis, Theory, Electric fields, Quantum mechanics, Nuclear physics.

21. NUCLEAR PROPULSION

AD-258 979 Div. 21, 20, 25
(5 July 61) OTS price $9.60

Aerospace Corp., El Segundo, Calif.
THE PLASMA CORE REACTOR,
by Seymour T. Nelson. 10 May 61, 111p. incl. illus. tables (Rept. no. TDR-594(1555-01)TN-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: Plasma physics, Nuclear reactions, *Reactor cores, Magnetic fields, Magnetic pinch, Propulsion, *Nuclear propulsion, Spaceships, *Space flight, *Aircraft nuclear propulsion.

Two types of plasma core reactor, considered as a space propulsion system of thrust-to-weight ratio exceeding unity, are investigated; viz, the simple magnetic bottle and the homopolar configurations. The principal system variables are indicated, and some upper- and lower-bounds for these are derived. The major problem areas and difficulties affecting feasibility are discussed. (Author)

22. ORDNANCE

AD-258 354 Div. 22
(22 June 61) OTS price $2.60

Picatinny Arsenal, Dover, N. J.
TESTS OF COMPOSITION B-LOADED SHELL CONTAINING EXCESSIVE CAVITATION AND BASE SEPARATION,
by R. J. Heredia, R. T. Schimmel, and S. J. Lowell. Apr 61, 1v. incl. illus. tables
(Technical memo. no. ORDBB-DR4-46)
Unclassified report

DESCRIPTORS: *High explosive ammunition, RDX, Projectiles, Loading, TNT, Cavitation, Explosives, Pressure, Specifications, Tests, Standards.

A firing test program to determine if Composition B loaded in 120mm T15E3 HE-T shell with 10 plus or minus 5% area of cavitation or with 5/64 + in. base separations can be tolerated was conducted. Two shells in each of these categories prematured low-order in the gun tube from 4 to 8 ft from the muzzle. Of the 4 shells that pre-

matured out of 160 fired, 2 had 8 and 9% cavitation while the other 2 had 1/8-in. base separations. All rounds were conditioned and fired at 140 F. The gun pressure was approximately 36,000 psi. The results indicated that the cavity standards of Military Specification MIL-L-20336A can be substantially relaxed but not to the extent of allowing 8% cavitation or 1/8-in. base separation. (Author)

AD-258 357 Div. 22
(22 June 61) OTS price $1.60

Albion Malleable Iron Co., Mich.
WARHEAD FOR ROCKET, BOOSTED, 115mm, HE, XM-54.
Progress rept. no. 13, 1-31 Mar 61, 10 Apr 61, 17p. incl. illus. tables.
(Contract DA 20-018-501-ORD-272)
Unclassified report

DESCRIPTORS: *Rockets, Warheads, Production, *Rocket heads, *High explosive ammunition, Boosters, Design.

AD-258 418 Div. 22
(26 June 61) OTS price $1.60

Frankford Arsenal, Philadelphia, Pa.
MEMORY OPTICS FOR RECOILLESS WEAPON SYSTEMS,
by J. Steinberg. Nov 60, 15p. (Memo. rept. no. M61-8-1)
(Proj. 502-01-008)
Unclassified report

DESCRIPTORS: *Optics, *Recoilless rifles, Phosphorescence, Theory, Phosphors, Tests, Recoil mechanisms, *Optical target designators, Optical equipment, Optical sights, *Telescopic gun sights, *Fire control systems.

A memory device is proposed which has a phosphor screen to permit the gunner of a recoilless weapon system to see the flash of the spotting round for a sufficient length of time to get on target (a few seconds). The requirements of such a system are discussed. A background discussion of the theory of phosphorescence is given and, in the light of the facts presented, requirements are given for the phosphor material. Results of preliminary tests and future plans are also presented. (Author)

AD-258 532 Div. 22
(26 June 61) OTS price $4.60

Scintilla Div., Bendix Corp., Sidney, N. Y.
SQUIB DEVELOPMENT PROGRAM,
by Rolland M. Purdy. Quarterly technical progress rept. no. 4, 1 Mar-1 June 61. 1 June 61, 37p. incl. illus. tables.
(Contract N178-7770)
Unclassified report

DESCRIPTORS: *Electric detonators, *Electric igniters, Epoxy resins, Heat resistant polymers, Resistance, Design, Electromagnetic waves, Radiofrequency, Ignition, Hazards, Sensitivity, Igniters, Sparks, Electric currents, Spark ignition, Metal coatings, Molding materials, Binders.

Study was continued on a program to determine the feasibility of using a spark gap shunted with a semi-conducting material in an electro explosive device to render it immune to stray RF. Effort was concentrated on raising the dc current values that can be carried without either exploding the squib or significantly affecting its firing characteristics. This problem has been attacked in three ways: (1) lower shunt resistance; (2) more heat resistant binder in the molded squib bodies; and (3) provision for better heat dissipation. Design is reported of a squib which possesses, in addition to the previously reported desirable characteristics, the ability to carry 6 amp dc indefinitely. This completes the parameters required and parts have been sent for RF testing and evaluation. (Author)

AD-258 533 Div. 22
(27 June 61) OTS price $3.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE DETERMINATION OF THE STRIKING VELOCITY OF STEEL FRAGMENTS BY THEIR MASS AND PENETRATION INTO WITNESS MATERIAL,
by C. W. Whiteford and J. M. Regan. Apr 61, 38p. incl. illus. tables (BRL memo. rept. no. 1333)
(Proj. no. 503-04-009)
Unclassified report

DESCRIPTORS: *Ammunition fragments, *Fragmentation ammunition, Fragmentation, Warheads, Projectiles, Penetration, Terminal ballistics, Velocity, Mathematical prediction, Equations, Mathematical analysis, Fiberboard, Measurement, Steel.

Experiments are described which relate the depths of penetration of steel cubes into wallboard to striking velocities ranging from approximately 200 to 900 m/s. An expression is derived which permits the determination of the striking velocity of a fragment, if its mass and penetration are known. (Author)

AD-258 548 Div. 22, 1
(26 June 61) OTS price $5.60

Frankford Arsenal, Philadelphia, Pa.
QUALIFICATION TESTS AND ANALYSES INITIATORS, CARTRIDGE ACTUATED, T25 AND T26,
by D. J. Savory and A. E. White. Mar 61, 50p. incl. illus. tables (Rept. no. R-1536)
(WADD TR 59-309) Unclassified report

DESCRIPTORS: *Explosive actuators, *Cartridges, Tests, Test methods, Jettisonable cockpits, *Miniature fuzes, Pressure, Statistical analysis, Reliability, Gases, Vibration, Temperature, *Safety devices, Aviation safety.

Tests were conducted to determine whether the miniaturized T25 and T26 initiators satisfied the performance requirements for the larger M3 and M5A1 initiators they are intended to replace. The T25 and T26 initiators were subjected to a complete qualification test program consisting of the following tests: safety pin pull, drop, low temperature ignition, locked-shut safety, performance, primer indent, environmental, and water immersion. The performance of these initiators during the tests was evaluated and compared with the performance characteristics of the M3 and M5 initiators. The average performance of the T25 and T26 initiators matches or exceeds that of the M3 and M5A1 initiators and meets all M3 and M5A1 design requirements and specifications. It is recommended (1) that the T25 and T26 initiators be

standardized for use in aircraft escape systems after modification of the T289 cartridge to meet pressure differential requirements, and (2) that the mounting ears on the initiator caps be lowered to provide a more convenient mounting surface, similar to that of the M3 initiator. (Author)

AD-258 583 Div. 22, 26
(27 June 61) OTS price $3.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
PROCESS ENGINEERING STUDY IN DETERMINATION OF FACTORS AFFECTING POOR LOW TEMPERATURE PERFORMANCE OF M17 PROPELLANT,
by Herbert M. Goldstein and Kenneth H. Russell. Technical rept. June 61, 12p. tables.
(Technical rept. no. DB-TR: 5-61)
Unclassified report

DESCRIPTORS: *Propellants, Low temperature research, Temperature, Tests, Manufacturing methods, Quality control, Solvent action, Mixtures, Processing, Preparation, Production, Propelling charges.

Processing engineering studies were conducted at Picatinny Arsenal and the Hercules Powder Company's Plant at Kenvil, New Jersey to determine the production factors affecting poor low temperature performance of M17 propellant. Various modifications of the basic propellant manufacturing techniques employed by these installations were used. Included were oversolvation, longer mixing cycles and different drying techniques - all based on the satisfactory Radford Arsenal process. Based on ballistic and closed bomb tests on these pilot propellant lots, it was found that satisfactory propellant (meeting the low temperature pressure limits) could be manufactured at Picatinny Arsenal and Hercules' Kenvil Plant. Improved processing techniques were developed and evaluated for these installations. (Author)

AD-258 593 Div. 22
(26 June 61) OTS price $3.60

Whirlpool Corp., Evansville, Ind.
A TEST OF THE MUZZLE BURST FEATURE OF THE MT T369 FUZE AT VARIOUS MUZZLE VELOCITIES FROM THE 105 MM HOWITZER USING T388 EXTENDED RANGE (MODIFIED) PROJECTILES,
by C. C. Clarke and Charles W. Haag. Special rept. on MT T369 Fuze Test 105MM Howitzer Application. May 61, 1v. incl. illus. tables.
(Contract DA 33-008-501-ORD-1800)
Unclassified report

DESCRIPTORS: *Projectiles, *Nose fuzes, Fuzes, Tests, Test methods, Reliability, *Howitzers, *Explosions, Spin, Velocity, *Propelling charges, *Time delay fuzes, *Gun barrels, *Projectile fuzes.

Tests were conducted to determine the distance from the muzzle that the T369 fuze would operate, to determine the minimum charge at which the T369 fuze will operate, and to determine the charge at which the T369 fuze will operate 50% of the time. Ten rounds were fired at Zone 10 charge and satisfactory muzzle burst action fuze functioning was evidenced somewhere between 11 and 19 ft from the muzzle on 9 of the 10 tests. Six rounds were tested at Zone 7 charge and one at Zone 9 with satisfactory performance in each round. Three rounds were tested at Zone 6 charge and fuze functioning occurred in one round only. (Author)

AD-258 616 Div. 22
(3 July 61) OTS price $2.60

Aberdeen Proving Ground, Md.
MALFUNCTION INVESTIGATION OF FUZE, MTSQ, XM548 (T197E2),
by L. W. Hasson. June 61, 21p. incl. illus. tables (Rept. no. DPS-265)
Unclassified report

DESCRIPTORS: Fuzes, Tests, Test methods, *Time delay fuzes, *Projectile fuzes, *Nose fuzes, Howitzers, Point detonating fuzes, Boosters, Aluminum, *Impact fuzes, Detonation, Reliability, Training ammunition.

One hundred and twenty-one fuzes, MTSQ, XM548 (T197E2) were assembled to inert- and HE-loaded semifixed rounds and fired for vertical recovery and airburst functioning. From the results of these tests it was concluded that this lot of fuzes, after modification of the closing plug by changing from brass to aluminum and increasing diameter from 1.500 to 1.580 inches, was satisfactory. (Author)

AD-258 644 Div. 22, 25
(28 June 61) OTS price $19.75

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TABLES OF COMPUTED THERMODYNAMIC PROPERTIES OF MILITARY GUN PROPELLANTS,
by Paul G. Baer and Kenneth R. Bryson. Mar 61, 303p. incl. illus. tables (BRL memo. rept. no. 1338)
(Proj. 504-01-036)
Unclassified report

DESCRIPTORS: *Thermodynamics, *Propelling charges, *Propellants, Propellant grains, *Guns, Design, Pressure, Temperature, Entropy, Density, Specific heat, Interior ballistics, Heat of formation, Ethanols, Water, Data, Volume, Nitrocellulose, Loading, Flames, Gases, Combustion, Statistical analysis, Tables.

Thermodynamic properties of all commonly used military gun propellants plus some experimental propellants are presented in tabular and graphical form. For the military propellants, these properties are given over a loading density ranging from 0.05 to 0.4 gm/cc. Comparisons are made between the propellants on the basis of force and isochoric flame temperature. The tables and data presented herein can be used for gun design computations. (Author)

AD-258 720 Div. 22
(29 June 61) OTS price $11.00

Sundstrand Aviation Div., Rockford, Ill.
CONCEPT, FEASIBILITY AND DESIGN STUDIES OF AN AUXILIARY-PROPELLED 105mm HOWITZER,
by Walter J. Zwierzycki. Final technical rept. on Phase 1. 29 May 61, 138p. incl. illus. tables.
(Contract DA 11-070-508-ORD-1343)
Unclassified report

DESCRIPTORS: *Howitzers, *Self-propelled guns, Design, Military requirements, Transmission.

Preliminary calculations were made to define the range of horsepower required to provide the desired performance. Energy sources, prime movers, power transmissions and propulsion methods

were then studied. From this study a military standard engine (Model 2A042), and a hydrostatic transmission were determined to be the best suited for the application. A hydrostatic transmission that would be capable of providing the desired highway and cross country mobility was developed that consisted of a 1.00 cu in./rev axial piston pump and a 4.47 cu in./rev axial piston motor powering each wheel through a final drive. Eleven installation, layout and outline drawings are presented in the report showing the system and its components applied to the 105mm Howitzer. Two pictorial views showing the auxiliary propelled weapon in its travelling and firing modes are also presented. The auxiliary propelled weapon will be capable of moving through 6'' of mud and on slopes of up to 60%. Operating and other characteristics are presented in graphical and tabular form. Computers were used extensively during this study to analyze as many possible systems as possible. (Author)

AD-258 754 Div. 22, 25
(29 June 61) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
SOUND VELOCITY AND ELASTIC MODULI MEASUREMENTS ON SEVERAL TNT-BASE EXPLOSIVE COMPOSITIONS,
by L. Aronica. 10 Feb 61, 19p. incl. illus. tables, 10 refs.
(NAVORD rept. no. 6087) Unclassified report

DESCRIPTORS: *Explosives, *TNT, Sound, Sound transmission, Explosions, Measurement, Velocity, Test methods, Elasticity, RDX, Stresses, Vibrations, Cylindrical bodies, Pentolite, Acoustics.

The velocity of longitudinal and transverse acoustical disturbances were measured for a number of cast explosive compositions in bar form by the disturbance resonance technique. Young's modulus, E, and the shear modulus, G, for the explosives have been derived from these measurements. The range in observations for these sound velocity measurements was on the order of 2 to 3%. The sound velocities are estimated reproducible to 1 to 2%; the computed moduli are therefore reproducible to 2 to 4%. It is observed, however, that results of this type are highly dependent upon the state and conditions of preparation of the particular charges used in the measurements. Corrections to apply to the results are discussed. The results for TNT are compared to those of other investigators. (Author)

AD-258 775 Div. 22
(29 June 61) OTS price $1.60

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND MANUFACTURE OF SPECIAL CALIBER .30 ELECTRIC PRIMERS,
by Fred Senko and Theodore B. Johnson. Monthly progress rept. no. 1, 21 Mar-30 Apr 61.
11 May 61, 18p. incl. illus. tables.
(Contract DA 19-020-ORD-5379, Proj. TN1-2707)
Unclassified report

DESCRIPTORS: *Electric primers, Switches, Tests, Test methods, Resistance, Measurement, Explosive trains, Mixtures, Primers.

Research concerns the development and manufacture of special caliber .30 electric primers for use in the T2 closed-to-open explosive switch. The specific object was to design and evaluate a method for the dynamic measurement of the resistance of the T2 switch over the period of about zero to 30 milliseconds after applying energy to the electric primer; and to make initial tests of primers with priming mixtures designed to reduce the amount of residue and/or increase the resistance of the residue. Results of tests indicate that the mixture residue may well have been reduced to a satisfactory level. It is felt that optimization of the primer charge weight and its confinement will result in satisfactory reliability, although slight modification of the switch positioning also may be necessary to achieve this. (Author)

AD-258 879 Div. 22
(3 July 61) OTS price $2.60

Aberdeen Proving Ground, Md.
RANGE-TABLE FIRING AND FUNCTIONING-CHARACTERISTICS DETERMINATION FOR CARTRIDGE, TRAINING, 81-MM, T32,
by P. D. Alston. June 61, 1v. incl. illus. tables (Rept. no. DPS-242)
Unclassified report

DESCRIPTORS: Mortars, *Mortar shells, *Cartridges, *Training devices, Tests, Smoke projectiles, Ballistics, Fin stabilized ammunition.

As a result of the development of new and improved ammunition for the 81-mm mortar, it became necessary to develop a compatible training round. The subject test program was fired to establish a range table for Cartridge, Training, 81-mm, T32 and to study its acceptability and endurance. The training cartridge was fired with ignition cartridge only and on impact, a smoke-generating firing fixture, housed within the fin, initiated a smoke cartridge simulating a fuze detonation on impact. The test results indicated that the training cartridge with a modified T178 fin containing a single diagonal smoke vent hole would be a good training round. The shell body and fuze was reusable for numerous repeated firings, although the fin with the metal insert in the ignition cartridge cavity withstood a lesser number of repeated firings. It is recommended that the metal insert be eliminated from the ignition cartridge cavity of the modified T178 fin, and that the T32 cartridge be adopted as a satisfactory training round. (Author)

AD-258 880 Div. 22
(3 July 61) OTS price $5.60

Aberdeen Proving Ground, Md.
SAFETY TEST OF SHELL, 8-INCH, T174E1,
by N. S. Flanders. June 61, 1v. incl. illus.
(Rept. no. DPS-254)
(Proj. 504-03-074)
(TPR no. TE-253) Unclassified report

DESCRIPTORS: *Chemical projectiles, Safety, Tests, Chemical warfare agents.

A total of 199 Shell, 8-Inch, T174E1 were fired. Forty-five of these rounds were fired at -40 F. Five others were fired at +140 F for recovery. The welded base was found to have separated from the burster tube in test round No. 50, and therefore all remaining burster tubes were returned to Picatinny Arsenal and the test was continued with burster tubes which had been strengthened at the welded base. The remaining

149 rounds were assembled with the strengthened burster tubes and fired at -140 F. No unusual incidents were noted in these last rounds and no defects were observed in the nine that were recovered. A conclusion was made that the Shell, 8-Inch, T174E1 assembled with the strengthened burster tube can be safely fired from the 8-inch howitzer, M2, under the conditions of these tests. Recommendations were made that consideration be given to the use of TNT as the burster explosive, rather than Comp B. Further tests were recommended, including an additional 300-round safety test from the first production lot. (Author)

AD-258 914 Div. 22, 8
(3 July 61) OTS price $1.60

Jansky and Bailey, Inc., Alexandria, Va.
A METHOD TO DETERMINE ELECTROMAGNETIC COUPLING TO ORDNANCE DEVICES ABOARD SHIPS,
by William T. Dickinson. 15 June 61, 10p. incl. illus. (Technical rept. no. 5456)
(Contract N178-7604)
Unclassified report

DESCRIPTORS: *Electric detonators, Shipborne, *Radiofrequency generators, Ship antennas, Impedance, *Electromagnetic effects, Measurement, *Hazards, *Naval ordnance, Mathematical prediction, Circuits, *Radio equipment, *Radar equipment.

A method is presented which permits the measurement of mutual impedance between electroexplosive devices and radio, radar, or other radio-frequency generators aboard ship. A prediction method was developed which reduced the entire electrical complex between the EED and sources of electromagnetic energy to an equivalent electrical circuit. Initially, it was extremely time consuming to make the measurements and computations necessary to define all elements of the equivalent electrical circuit. Gradually, it became obvious that it was unnecessary to make many of these measurements and computations. The equivalent circuit methods of prediction have the advantages of negligible instrument perturbation and the use of sensitive instruments which permit extremely low power radiation and, consequently, have more freedom in frequency usage. (Author)

AD-258 947 Div. 22
(30 June 61) OTS price $2.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
HAZARD CLASSIFICATION TEST ON DUPONT S68 SQUIBS,
by Kenneth A. Kartchner. May 61, 41p. incl. illus. (Rept. no. OOY TR 61-18)
Unclassified report

DESCRIPTORS: *Hazards, *Classification, Tests, *Electric detonators, *Electric igniters.

Hazard classification tests were conducted on 2 boxes, each containing fifty S-68 squibs. One squib in the bottom box was connected to a firing circuit and functioned. Another box containing fifty S-68 squibs, was burned in a gasoline and wood fire. Separate tests were conducted for the 4-grain, 10-grain, and 15-grain squibs. In the propagation test using 4-grain squibs only one adjacent squib was dented. When one 10-grain squib was functioned one other squib was punctured and three were dented. When one 15-grain squib was functioned one other squib was severed and four received heavy dents. All other squibs were in serviceable condition after above test. In the cook-off test most of the squibs were cooked off. From tests using larger grain squibs it was found that when larger grain squibs cooked off more of the adjacent squibs were thrown clear of the fire. The adjacent squibs did not propagate in any of the above tests. In the fire test the squibs cooked off singly or a few at a time and did not detonate en masse. (Author)

AD-259 019 Div. 22
(6 July 61) OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A SINGLE CHART SYSTEM OF INTERIOR BALLISTICS,
by R. C. Strittmater. Mar 61, 13p. (BRL rept. no. 1126)
Unclassified report

DESCRIPTORS: *Guns, *Interior ballistics, Mathematical analysis, Projectiles, Tests, Corrections, Propelling charges, Ballistics, Test methods.

A graphical method which has been used in the Interior Ballistics Laboratory during the past few years to make estimates of the interior ballistic performance of guns is presented. This method utilizes a chart which gives rapid solutions to some common problems in interior ballistics. The Mayer-Hart assumptions were made in writing the equations on which the chart is based. It was also assumed that bore friction is proportional to chamber pressure. This is equivalent to giving the projectile an effective mass somewhat higher than its actual mass. This assumption provided a factor which could be tailored to bring chart and experiment into closer agreement. The data from 165 firing records were compared with the chart and a form for the effective mass of the projectile was determined which considerably improved the agreement of chart with experiment. (Author)

23. PERSONNEL AND TRAINING

AD-258 351 Div. 23, 1, 13
(26 June 61) OTS price $1.60

Air Force Proving Ground Command, Eglin Air Force Base, Fla.
PERFORMANCE EVALUATION OF FLIGHT SIMULATOR SPECIALISTS. GRADUATES OF ATC COURSE ABR34230,
by Grey L. Adams. May 61, 15p. incl. illus.
(APGC TR 61-28)
(Proj. 998HL43)
Unclassified report

DESCRIPTORS: Flight simulators, *Aviation personnel, *Training, Effectiveness, Tests, Analysis, *Personnel, Aircraft equipment, Maintenance.

This evaluation was conducted to determine the ability of flight simulator specialists graduating from Air Training Command Course Nr ABR34230 to perform the duties of their specialty. The performance of two groups of apprentices working under operational conditions

was evaluated for a 90-day period. After three to seven weeks on the job, the apprentices were capable of performing the duties required in the majority of their assignments. The apprentices were well trained in the adjustment of certain simulator systems and equipment and in the use and care of test equipment. The apprentices were familiar with publications and the use of hand tools but unfamiliar with the operation of control systems and adjustment of components, which represent the primary duties of an operator. The supervisors and apprentices alike felt that the resident course should be altered to include additional training in electronic fundamentals and instruction in the Greek alphabet and current aircraft simulators, by manufacturer's type if practical. (Author)

AD-258 477 Div. 23, 1, 33
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AVIATION REVIEW (SELECTED ARTICLES).
2 Mar 61, 9p. incl. illus. (Trans. no. MCL-748 Letecky Obzor 4:pp. 166-167, 189, 1960)
Unclassified report

DESCRIPTORS: Air transportation, *Aviation personnel, *Training, *Pilots, USSR, Transport planes, Flight testing, Jet planes.

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-258 525 Div. 24, 2
(26 June 61) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
THE METEOROLOGICAL FACTORS AFFECTING PHOTOGRAPHIC RECONNAISSANCE FROM VERY HIGH ALTITUDES, by Karl R. Johannessen. May 61, 8p. incl. illus. table (Technical rept. no. 154)
Unclassified report

DESCRIPTORS: Aerial reconnaissance, *Aerial photography, High altitude, *Climatic factors, Clouds, Aerosols, Particles, Optical analysis, Turbulence, Brightness, Visibility.

Successful missions of photographic mapping and photographic reconnaissance from the air require a minimum of cloud cover. Cloud-cover forecasts are obtained prior to each mission. For photography from very high altitudes with high-resolution camera systems, the effects of other obscuring factors besides clouds must be considered. Dust and other aerosols suspended in the atmosphere reduce the brightness contrast of ground targets. Shimmering due to optical turbulence may distort details and prevent target recognition. A brief survey is given of the obscuring factors affecting photography from very high altitudes. Numerical data on aerosols and optical turbulence are included. (Author)

AD-258 635 Div. 24
(28 June 61) OTS price $6.60

Army Electronic Proving Ground, Fort Huachuca, Ariz.
EVALUATION OF KS-54 CAMERA SYSTEM, by Franklyn W. Eaton. Final rept. Jan 61, 68p. incl. illus. (Rept. no. AEPG-SIG 930-177)
Unclassified report

DESCRIPTORS: *Aerial cameras, Flight testing, Photographic equipment, Reliability, Photoflash cartridges, Night photography, Aerial reconnaissance.

Day and night flights were made at altitudes of 500 to 3,000 feet above terrain to evaluate the KS-54 camera system. The M-112, 2-sec delay photoflash cartridges were used in the A-12 Photoflash Cartridge Ejector. The minimum altitude at which usable night aerial photographs can be made is 500 ft above terrain and the maximum is 2,000 ft above terrain. The LA-140A Camera pod could be removed from the aircraft in 2 min or less and the LS-26A Ejector Group could be removed in about 15 min. Twenty-five minutes were required for complete system installation. The KS-54 Camera System is suitable for day and night reconnaissance photography provided the manufacturer's quality control methods are improved, an auxiliary control box is provided so the aviator may operate the system more easily, and the ejector mount is designed to provide a greater rearward and outward firing angle. (Author)

AD-258 655 Div. 24, 2, 30
(28 June 61) OTS price $3.60

Geophysics Corp. of America, Bedford, Mass.
THE DESIGN, CONSTRUCTION AND OPERATION OF GROUND-BASED TRACKING EQUIPMENT FOR EXPERIMENTS UTILIZING OPTICAL TRACE MATERIALS TO STUDY ATMOSPHERIC PARAMETERS,
by R. J. Jenkins and E. Manring. Mar 61, 1v. incl. illus. (GCA Technical rept. no. 61-2-N)
(Contract NAS5-215)
Unclassified report

DESCRIPTORS: Atmosphere, *Upper atmosphere, *Optical tracking, Atmospheric sounding, Sounding rockets, Sodium, Instrumentation, *Cameras, Astronomical cameras, Focusing, Photographic analysis, Design, Construction, Operation.

Contents:
Instrumentation and equipment
70-mm camera
70-mm camera mounts
Exposure timing unit
Auxiliary equipment
Installation of photographic sites
Selection of sites
Installation of sites
Mount position and orientation
Communications
Variations in lens openings

Division 25 - PHYSICS

25. PHYSICS

AD-258 350 Div. 25
(26 June 61) OTS price $5.60

AVCO Research Lab., Everett, Mass.
ON THE LIMITING VELOCITY FOR A ROTATING PLASMA,
by Shao-Chi Lin. Apr 61, 51p. incl. illus. table
(Research rept. no. 101)
(Contract AF 19(604)7458)
(AFCRL-334) Unclassified report

DESCRIPTORS: *Plasma physics, *Velocity, *Magnetohydrodynamics, Gas ionization, Heat transfer, Motion, Mathematical analysis, Rotation, Equations, Particle accelerators, Ion accelerators.

A quasi-steady state solution was obtained for a homogenous plasma undergoing simultaneous ionization and rotation in a crossed electric-magnetic field. It was found that the ordinary electron-impact ionization process, when supported by the Landau ion-electron heat transfer mechanism, will be sufficiently rapid to provide a close coupling between the kinetic energy of the ions and the ionization energy of the neutrals under a wide range of conditions. The results can be used to interpret the limiting velocity observed by Alfven (Rev. Mod. Phys. 32:710 (1960)) and Fahleson (Phys. of Fluids 4:123 (1961)) in some recent rotating plasma experiments. The same results can also be used to predict the occurrence of similar limiting velocity in some rectilinear plasma accelerators. (Author)

AD-258 353 Div. 25, 8
(26 June 61) OTS price $1.60

Chalmers U. of Tech. (Sweden).
RESEARCH IN THE FIELD OF PROPAGATION AND INTERACTION OF ELECTROMAGNETIC WAVES AND SPACE CHARGE TYPE WAVES IN HOMOGENEOUS AND INHOMOGENEOUS MEDIA,
by O. E. H. Rydbeck. Final technical rept. 1 Oct 58-30 Sep 60, Dec 60, 19p.
(Contract AF 61(052)159)
(AFCRL-163) Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Space charge, Electromagnetic wave reflections, Microwaves, Plasma physics, Propagation, *Electron beams, Traveling wave tubes, Exosphere, Sweden.

The research dealt with various phases of electromagnetic and electronic wave interaction with application to the fields of electromagnetic wave propagation and microwave type physics: Typical applications: Reflection of electromagnetic waves from electron streams, excitation of electromagnetic waves in plasmas, electron stream whistler interaction in the exosphere, wave interaction in traveling wave tubes, etc. A general coupling theory was developed for multi-anisotropic wave media. It was shown that several Doppler modes, of different frequencies, may be excited by a moving source in highly dispersive media. (Author)

AD-258 356 Div. 25
(22 June 61) OTS price $1.60

Israel Institute of Technology, Haifa, Israel.
THE EFFECT OF AXIAL CONSTRAINT ON THE INSTABILITY OF THIN CONICAL SHELLS UNDER EXTERNAL PRESSURE,
by Josef Singer. Dec 60, 12p. incl. illus.
(Technical note no. 2)
(Contract AF 61(052)339)
(AFOSR-TN-60-860) Unclassified report

DESCRIPTORS: *Conical bodies, Stability, *Structural shells, Mathematical analysis, Hydrostatic pressure, Deformation, Design, Stresses, Elasticity, Theory, Pressure.

The effect of axial elastic restraint in the direction of the generators on the instability of a thin circular conical shell under hydrostatic pressure, or under uniform lateral pressure, is analysed by a Rayleigh Ritz approach. For the case of hydrostatic pressure, the effect is calculated for wide range of parameters and design curves are presented for the percentage increase in critical pressure. (Author)

AD-258 371 Div. 25
(29 June 61) OTS price $1.60

Westinghouse Research Labs., Pittsburgh, Pa.
OPTICAL SATURATION OF F-CENTER SPIN RESONANCE,
by B. R. McAvoy, D. W. Feldman and others. Apr 61, 7p. incl. illus. table (Scientific rept. no. 9; Scientific paper no. 908C901-P2)
(Contract AF 19(604)5589, Proj. 4156)
(AFCRL-355) Unclassified report

DESCRIPTORS: *Potassium compounds, *Chlorides, Crystals, *Resonance absorption, *Microwave spectroscopy, Electron optics, Relaxation time, Spin, Light transmission.

CW absorption of F-band light by F-centers in KCl crystals at 2 K and 3 kilogauss is found to speed up spin relaxation and to raise the steady state spin temperature. The observations are well fitted to the model of the F-center involving no preferential optical pumping, as expected. (Author)

AD-258 376 Div. 25, 14, 17
(29 June 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
STUDY OF THE MAGNETIZATION OF THIN, EVAPORATED NICKEL FILMS IN A CHANGING ENVIRONMENT,
by C. A. Neugebauer. June 61, 18p. incl. illus. tables, 36 refs. (Scientific rept. no. 2)
(Contract AF 19(604)5566)
(AFCRL-365) Unclassified report

DESCRIPTORS: *Thin films, *Nickel, *Metal films, Magnetic properties, Vacuum systems, Oxygen, Hydrogen, Copper, Torque, Oxidation, Adsorption, Measurement, Magnetic coatings.

The magnetization of Ni films in the thickness range from a few to several hundred angstroms was investigated first under ultrahigh vacuum conditions and then after exposure to an O or H atmosphere at various pressures. Oxidation of the films to a depth of 10 to 15 angstroms takes place in a short time even at pressures of oxygen in the 10 to the -8th power mm range. Exposure to H of initially clean films resulted only in reversible changes of the transverse anisotropy constant. Unusually large increases in the transverse anisotropy of Ni films result when one changes a Ni-vacuum interface to a Ni-Cu interface. (Author)

AD-258 381 Div. 25, 4
(27 June 61) OTS price $1.60

Brussels U. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURE. PART II. MASS SPECTROMETRIC STUDIES OF THE VAPORIZATION OF SULPHIDES AND THE DISSOCIATION ENERGY OF S2,
by R. Colin, P. Goldfinger and M. Jeunehomme.
Rept. for Mar 59-Mar 60 on Refractory Inorganic Nonmetallic Materials. Nov 60, 8p. incl. table, 22 refs.
(Contract AF 61(052)225, Proj. 7350)
(WADD TR 60-782, pt. 2) Unclassified report

DESCRIPTORS: *Sulfides, *Sulfur compounds, *Sulfur, Chemical equilibrium, Mass spectrometers, Dissociation, Mass spectroscopy, *Vaporization, High temperature research, Alloys, Thermochemistry, Thermodynamics, *Calcium compounds.

The equilibria $S_2 \rightleftharpoons 2S$ and $CaS \rightleftharpoons Ca + S$ have been observed in the vapor phase above CaS. $D_0^0(S2) = 4.4 \pm 0.2$ e.v., $D_0^0(SO) = 5.4 \pm 0.2$ e.v., $D_0^0(CaS) = 3.7 \pm 0.2$ e.v., and $\Delta H_{298}^{vap}(CaS) = 5.9 \pm 0.2$ e.v. have been determined mass spectrometrically. (Author)

AD-258 383 Div. 25, 14
(29 June 61) OTS price $.75

National Bureau of Standards, Washington, D. C.
PHYSICAL PROPERTIES OF HIGH TEMPERATURE MATERIALS. PART VI. ENTHALPY AND HEAT CAPACITY OF MAGNESIUM OXIDE, ZIRCONIUM OXIDE, AND ZIRCONIUM SILICATE FROM 0 TO 900 C,
by Andrew C. Victor and Thomas B. Douglas. Rept. for 31 Mar 57-21 Dec 59 on Materials Analysis and Evaluation Techniques. Dec 60, 16p. incl. illus. tables.
(Contract AF 33(616)56-21, Proj. 7360)
(WADC TR 57-374, pt. 6) Unclassified report

DESCRIPTORS: *Refractory materials, *Magnesium compounds, *Zirconium compounds, Oxides, Silicates, Physical properties, Enthalpy, Specific heat, Thermodynamics, Measurement, Calorimeters, Ceramic materials, High temperature research.

The heat contents of three refractory substances, magnesium oxide, zirconium oxide, and zirconium silicate were measured relative to 0 C at 100-degree intervals up to 900 C, using a precise drop calorimetric method. The magnesium oxide sample was of high purity. The other samples, however, were of relatively low purity. No attempt was made to correct heat-content and heat-capacity values for impurities. Specific heats were derived from and described by equations in calories per gram-deg C. The specific heats from these equations were compared with values from the literature. (Author)

AD-258 384 Div. 25
(10 July 61) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
STRUCTURE OF DEFECT CLUSTERS IN SOLIDS,
by John W. Buttrey. Terminal rept. 1 Mar 60-15 Mar 61, 12 May 61, 27p. 19 refs.
(Contract AF 49(638)829)
(AFOSR-732) Unclassified report

DESCRIPTORS: *Solids, *X-ray diffraction analysis, *Lithium compounds, *Fluorides, *Scattering, Silicon, Lithium, Single crystals, Solid state physics, Crystal structure, Lattices, Neutrons, Particles, Fast neutrons.

Preliminary results have been achieved on a small angle scattering study of defect clustering in irradiated single crystals. Silicon single crystals irradiated to a total of 2 x 10 to the 19th power nvt fast neutron flux fail to show any small angle scattering. Some small angle x-ray scattering was detected from a lightly irradiated sample of LiF, but preliminary results from a lithium-doped silicon single crystal are negative, even though it was thought to contain 100 A clusters of pure lithium metal. Such clusters should be detectable using small angle x-ray diffraction; no conclusive reasons are apparent why this sample did not show small angle scattering. Scattering intensity calculations are treated in an appendix. (Author)

AD-258 393 Div. 25, 4
(26 June 61) OTS price $1.60

Mellon Institute, Pittsburgh, Pa.
SOLID-STATE VIBRATIONAL SPECTRA OF METHYL AND METHYL-d3 CYANIDE,
by Dolphus E. Milligan and Marilyn E. Jacox.
25 May 61, 18p. incl. illus. 10 refs.
(Contract AF 49(638)542)
(AFOSR-763) Unclassified report

DESCRIPTORS: Methyl radicals, *Deuterated compounds, *Nitriles, *Cyanides, Thin films, Vibration, Absorption, Solid state physics, Crystal structure, *Infrared spectroscopy.

The vibrational fundamentals of thin films of CH3CN and CD3CN at 77 K were observed using a high resolution, double beam grating spectrometer. Evidence is presented for 3 absorptions, assigned to nu3, nu6, and (nu7 + nu8), in the 1/1300 to 1/1500 cm region of the CH3CN spectrum. Annealing from an initial glassy state to a crystalline form is observed for these deposits. The multiplet structure of the annealed samples indicates that CH3CN and CD3CN crystallize in the orthorhombic, tetragonal, or trigonal system. Contrary to predictions based on quadrupole resonance studies, the crystal does not preserve the threefold symmetry of the molecule about its CN triple bond. Although assignment to a crystal class must remain indefinite, the simplest possibility has point symmetry C sub 2v. (Author)

AD-258 398 Div. 25
(26 June 61) OTS price $8.60

Microwave Physics Lab., Mountain View, Calif.
INVESTIGATION OF NONLINEAR PHENOMENA ASSOCIATED WITH IONIZED PLASMAS.
Final rept. 1 May 61, 1v. incl. illus. 23 refs.
(Contract AF 19(604)4083)
(AFCRL-339) Unclassified report

DESCRIPTORS: *Plasma physics, *Gas ionization, Electromagnetic waves, Harmonic analysis, Theory, Experimental data, *Microwaves, Physical properties, Measurement.

The investigation of the nonlinear interaction of an electromagnetic wave and an ionized gas in the presence of dc magnetic field is described. A theoretical analysis was made of the harmonic power generated within a plasma layer of finite dimensions in the direction of propagation. It

was assumed that the electromagnetic wave propagates in the direction normal to the direction of the dc magnetic field and that the plasma is of uniform electron density distribution throughout the plasma layer. The theoretical analysis employed a small signal assumption, and within this assumption power at the h-th harmonic was predicted. A reiteration technique was used in order to predict the effects of these harmonics on propagation at the fundamental frequency. An experimental program endeavored to produce, in the laboratory, an ionized gas whose characteristics agree with the theoretical assumptions. Curves of the experimental results are presented and compared with the theoretical predictions. (Author)

AD-258 414 Div. 25, 17
(22 June 61) OTS price $1.10

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Ru2Si,
by Bertil Aronsson and Jan Aselius. 17 Apr 61
5p. tables (Technical note no. 23)
(Contract AF 61(052)40)
(AFOSR-380) Unclassified report

DESCRIPTORS: *Ruthenium compounds, Crystal structure, *Silicides, Alloys, X-ray diffraction analysis, Intermetallic compounds, Powder alloys, Phase studies, Crystals.

Alloys of Ru and Si were prepared by arc-melting or by sintering. By examining the powder photographs of the arc-melted alloys which had been allowed to cool rapidly in the arc furnace, it was found that alloys with nominal compositions ranging from RuSi.33 to RuSi.50 contained Ru and Ru2Si, while alloys RuSi.54 to RuSi.56 contained Ru2Si and an unknown phase (or phases) probably more Si-rich than Ru2Si. In the powder photograph of RuSi.52, only the powder lines of Ru2Si could be detected. The powder photographs of alloys prepared by sintering at 1100 C were complex and no phase with the C23 structure was present in these alloys. An intermediate phase was observed in the Ru-Si system with a composition closely corresponding to the formula Ru2Si. The crystal structure of Ru2Si was refined from single crystal data until the difference synthesis did not display any gradients at the atomic positions. Structural data indicated that a is equal to 5.27 sub 9, b is equal to 4.00 sub 5, c is equal to 7.41 sub 8, and U is equal to 156.8 angstroms.

AD-258 415 Div. 25, 4, 17
(22 June 61) OTS price $1.10

Uppsala U. (Sweden).
DIPHOSPHIDES OF THE GROUP VIII TRANSITION METALS,
by Stig Rundqvist. 14 Mar 61, 3p. tables,
13 refs. (Technical note no. 22)
(Contract AF 61(052)40)
(AFOSR-195) Unclassified report

DESCRIPTORS: *Transition elements, *Metallic compounds, *Phosphides, Crystal structure, Synthesis, X-ray diffraction analysis, Crystals, Growth, Single crystals, Powder metals.

RhP2, IrP2, NiP2, and PdP2 were synthesized by heating mixtures of metal powder and red phosphorus in evacuated and sealed silica tubes between 800 and 1100 C. Analysis of the X-ray powder patterns indicated that the diffraction lines can be indexed on the basis of monoclinic unit cells. Powder data indicated that RhP2 and IrP2 are isostructural. NiP2 and PdP2 are also isostructural, and appear to have face-centered unit cells.

AD-258 416 Div. 25, 17
(22 June 61) OTS price $1.10

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Pd3P,
by Stig Rundqvist and Lars-Otto Gullman.
3 Jan 61, 3p. incl. table (Technical note.
no. 21)
(Contract AF 61(052)40)
(AFOSR-151) Unclassified report

DESCRIPTORS: *Palladium compounds, Phosphides, Crystal structure, X-ray diffraction analysis, Alloys, Intermetallic compounds.

An X-ray investigation of the Pd-P system was initiated. Preliminary results indicated the apparent existence of at least 4 intermediate phases in the range of 0 to 25 at-%P. The existence of a phase near the composition Pd3P was confirmed. The homogeneity range determined from alloys quenched from 740 C extended from about Pd3P.75 to Pd3P1. The crystal structure was determined by examination of single-crystals selected from an alloy with the approximate composition PdeP.95. The following structural data for PdeP.95 were obtained: a equal to 5.947, b equal to 7.451, c equal to 5.170, and U equal to 229.1 angstroms.

AD-258 420 Div. 25, 2, 12
(26 June 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
HORIZONTAL AIR-MASS TABLES,
by R. J. Stirton and A. J. Krueger. 15 Mar 61,
24p. incl. illus. tables (Rept. no. NOTS TP 2648)
(NAVWEPS rept. no. 7636) Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, Tables, Visibility, *Illumination, Atmosphere, Density, Air mass analysis, Integration, Numerical methods and procedures, *Light, *Reflection, Ozone, Distribution, Upper atmosphere.

The illumination of artificial earth satellites during their motion into the earth's shadow is a problem of current interest. For height above the surface greater than 20 km, the tangential solar ray incident on a satellite in a non-absorbed region of the spectrum is attenuated principally by Rayleigh scattering. The attenuation is a function of the total number of molecules, or, if the molecular weight remains constant, of the air mass along the path of the ray that is tangential to any level, h, above the surface. Tables are given in terms of mass of air and number of molecules for a vertical path originating at h, a horizontal path tangent to h, the horizontal quantities relative to a unit atmosphere, and the rate of change with respect to h. The tables cover an altitude range of 0 to 100 km, calculated for an atmosphere terminated at 200 km. These tables are intended primarily for use above a nominal altitude of 20 km, where refraction, which was not allowed for in the computations, has a negligible effect. (Author)

AD-258 422 Div. 25
(23 June 61) OTS price $2.60

Rensselaer Polytechnic Inst., Troy, N. Y.
THE BENDING OF COLUMNS UNDER AXIAL LOADS OF RANDOM ECCENTRICITY,
by William E. Boyce. 22 May 61, 16p. illus. table (RPI MathRep no. 43)
(Contract AF 49(638)962)
(AFOSR-703) Unclassified report

DESCRIPTORS: *Beams, *Deformation, Load distribution, Mathematical analysis, Differential equations.

An initially straight, homogeneous, isotropic, elastic column is subjected to axial loads whose location with respect to the center line of the column is given by a random eccentricity at each end. Methods are advanced which, on the basis of assumptions concerning the statistical distribution of the eccentricities, provide answers to the following questions: (1) What is the probability that the maximum transverse column displacement occurs in a given interval of the column. (2) For a given load (or for a given absolute midspan displacement,) what is the probability that the absolute midspan displacement (or load) lies between preassigned bounds. (Author)

AD-258 426 Div. 25, 15
(26 June 61) OTS price $9.60

Chalmers U. of Tech. (Sweden).
THE PROPAGATION AND COUPLING OF WAVES IN INHOMOGENEOUS MEDIA WITH APPLICATIONS TO ELECTROMAGNETIC AND SPACE CHARGE WAVES (ON THE PROPAGATION OF WAVES IN AN INHOMOGENEOUS MEDIUM II),
by O. E. H. Rydbeck. Mar 60, 113p. incl. illus. 92 refs. (Research rept. no. 7)
(Contract AF 61(052)159)
(AFCRL-161) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Space charges, Propagation, Bessel functions, Equations, Plasma physics, Transformations (Mathematics), Amplifiers.

Contents:
The second order wave equation
The coupled amplitude equations of the second order-wave equations
Examples of 4-wave systems
The general nth order wave equation treated by coupling methods
Energy flow relations of the n-wave system
Intensity relations of the n-wave system
Transformation of the first order coupled equations
On the choice of the total field of the coupled system and the boundary conditions
The geometrical interpretation of the amplitude transformation coefficients of the n-wave system

AD-258 430 Div. 25
(26 June 61) OTS price $5.60

Stevens Inst. of Tech., Hoboken, N. J.
INVESTIGATION OF PLASMA ACCELERATION,
by K. C. Rogers, G. Schmidt and others. Final rept. for 10 Sep 60-15 May 61 on Megatron Accelerator. 15 May 61, 38p. incl. illus. (Rept. no. SIT P37 (6/61)
(Contract DA 36-039-sc-78097)
(ARPA Order no. 112-60) Unclassified report

DESCRIPTORS: *Plasma physics, *Magnetic fields, Acceleration, *Accelerators, Betatrons, Particles, Electrons, Electron beams.

This report includes:
THE CAPTURE OF THERMAL ELECTRONS INTO STABLE BETATRON ORBITS. PART I, by K. C. Rogers and G. Schmidt. 15 May 61, 10p. incl. illus. (Rept. no. SIT P38 (6/61)
(Contract DA 36-039-sc-78097)
(ARPA Order no. 112-60)

Construction of an air-core plasma betatron is described. A method of shaping the magnetic field by eddy currents is described and field measurements are presented. Methods of obtaining low density plasmas suitable for plasma betatrons are described. In addition, work on plasma betatron theory and particle capture into betatron orbits is presented. (Author)

AD-258 434 Div. 25, 8, 15
(26 June 61) OTS price $14.50

Chalmers U. of Tech. (Sweden).
ELECTROMAGNETIC AND SPACE CHARGE WAVES IN INHOMOGENEOUS STRUCTURES WITH APPLICATIONS TO IONIZED MEDIA AND MICROWAVE TUBES,
by O. E. H. Rydbeck. Mar 60, 215p. incl. illus. 62 refs. (Research rept. no. 8)
(Contract AF 61(052)159)
(AFCRL-162) Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Space charges, Theory, Equations, *Traveling wave tubes, Plasma physics.

Contents:
Space charge waves and electromagnetic waves in ionized streams in the presence of a strong, focusing magnetic field
Application of the telegraph equation of the electron stream to microwave tube problems
Examples of application of space charge wave theory to microwave tube problems

AD-258 439 Div. 25
(20 June 61) OTS price $6.60

Israel Inst. of Tech., Haifa.
INTERACTION OF A TEST PARTICLE WITH A PLASMA. PART II. ENERGY LOSS OF THE TEST PARTICLE,
by G. Kalman and A. Ron. 20 Mar 61, 66p. 21 refs.
(Technical note no. 2)
(Contract AF 61(052)177)
(ARL-72) Unclassified report

DESCRIPTORS: *Plasma physics, *Particles, Perturbation theory, Electric fields, *Energy, Polarization.

perturbation analysis of the energy loss suffered by a test particle travelling through a plasma is considered. The action of the system on the particle is described as a combined result due to the polarization of the medium and to the correlated fluctuations of the electric microfield. The calculation is extended up to order e6. Higher order effects appear through binary, ternary etc. time correlations of the electric field and its derivatives related to a single point, to the points of a triangle, etc. of the unperturbed system. The possibility of a systematic extension to higher orders is indicated. (Author)

Division 25 - PHYSICS

AD-258 449 Div. 25
(21 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
UKRAINIAN PHYSICS JOURNAL (SELECTED ARTICLES).
1 Mar 61, 19p. incl. illus. (Trans. no. MCL-39 from Ukrainskiy Fizichniy Zhurnal 3:pp. 646-650, 688-689, 693-694, 1958)

Unclassified report

DESCRIPTORS: *Barium, Barium compounds, Oxides, Molecules, Adsorption, *Tungsten, Atoms, Surfaces, Metal films, Cathodes, *Ion beams, *Plasma physics, Penetration, Magnetic fields, Electric fields, Ionic current, Ions, Gas ionization.

Contents:
Adsorption of barium atoms and barium oxide molecules on tungsten
The problem on the form in which metal-film cathodes exist
Utilizing the action of a magnetic field upon a penetrating plasma in acquiring intensive ionic beams

AD-258 468 Div. 25, 9
(21 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE THERMAL BARRIER IN SUPERSONIC FLIGHT (SELECTED PARTS) (Teplovoy Bar'yer Pri Sverkhzvukovykh Skorostyakh Poleta),
by N. Ye. Zhovinskiy. Feb 61, 28p. incl. illus. table (Trans. no. MCL-647, USSR: pp. 26-34, 59-65, 79-83, 83-92, 1959)

Unclassified report

DESCRIPTORS: *Aerodynamic heating, Supersonic flow, Semiconductors, Cooling, Aircraft, Ultrasonics, Heat exchangers, Sweat cooling, Jet fighters, Airframes, Thermal stresses, Titanium alloys, Ablation, USSR, Model tests, Heat transfer.

Contents:
The thermal barrier
Titanium and its alloys
Protection of aircraft structures against overheating at high speeds
Cooling
  Evaporative cooling
  Fuel cooling
  Cooling by ultrasonic vibrations
  Cooling by means of semiconductors

AD-258 475 Div. 25
(21 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MEASURE OF THERMODYNAMIC VALUES BY MASS SPECTROMETRY, STUDY OF SILVER AND COPPER,
by Georges Verhaegen. 21 Dec 60, 33p. incl. illus. table, 23 refs. (Trans. no. MCL-742 of Measures de Grandeurs Thermodynamiques par Spectrometrie de Masse Etude de l' Argent et du Cuivre: pp. 29, Sep 59)

Unclassified report

Treatise presented for the conferment of the scientific degree of Licentiate in Chemical Sciences, Free University of Brussels.

DESCRIPTORS: Silver, Copper, Heat of sublimation, *Thermodynamics, Thermocouples, *Mass spectroscopy, Vapor pressure, Crucibles.

A thermocouple assembly was set up in order to measure in a satisfactory manner the temperature of microcrucibles used in a mass spectrometer for the study of solid or liquid compounds below 1100 K. The vapor tension and latent heat of sublimation of copper and silver were measured by mass spectrometry. The values for the latent heat of sublimation for Cu and Ag at 298 degrees K were, respectively, 68.38 and 80.0 kcal/mole. (Author)

AD-258 479 Div. 25, 2
(21 June 61) OTS price $8.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCATTERING OF LIGHT IN THE TERRESTRIAL ATMOSPHERE,
by G. V. Rozenberg. 24 Feb 61, 83p. incl. illus. (Trans. no. MCL-754 of Uspekhi Fizicheskikh Nauk 71:pp-173-213, June 60)

Unclassified report

DESCRIPTORS: *Optics, Atmosphere, *Light, Brightness, *Sky brightness, Atmospheric refraction, Scattering, Polarization, USSR, *Light transmission.

Contents:
Enigma of the daytime sky and the discovery of the scattering of light
Description of light and the properties of the medium in the scattering event
Atmospheric transparency and aerosols
Polarization chart of the sky, anisotropy of molecules, and multiple scattering
Brightness chart of the sky and the function of scattering
Optic exploration of the atmosphere and the problem of interpretation of the data
Scattering of light in clouds and in fogs, and related problems
Radiation climatology and the optics of aerosols

AD-258 486 Div. 25
(21 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DEVELOPMENTS IN THE ELECTRON-ACCUMULATING MASS SPECTROMETRY OF POLYATOMIC MOLECULES,
by Manfred von Ardenne. 23 Feb 61, 30p. incl. illus. table (Trans no. MCL-818 of Zeitschrift fur Angewandte Physik 11:pp. 121-131, 1959)

Unclassified report

DESCRIPTORS: *Mass spectroscopy, Ions, Plasma physics, Electrodes, Cathode ray tubes, Mass spectrometers, Organic compounds, Electron guns, *Molecular spectroscopy.

From the discussion of the types and effective cross-sections of the processes for forming negative molecular ions it is obvious that EA mass spectrography (abbreviation of electron-accumulating mass spectrography) of polyatomic organic molecules requires a highly developed ion source with an extra high density of slow electrons and relatively high molecular vapor density. The principle of operation and construction and two methods of operation of electron-accumulating ion sources (Type B, improved form) with a high working efficiency are discussed. The design and the plasma physics of a source with greatly reduced axial potential-selection for negative molecular ions is treated in detail. Various EA spectra are presented in which an exact mass calibration was possible by means of positively identified lines from standardized substances. (Author)

AD-258 487 Div. 25, 14
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DYNAMIC PROPERTIES OF VISCOELASTIC MATERIALS DURING NONHARMONIC LOADING (STRESSING) (Dinamicheskiye Svoysrva Vyazko-Uprugikh Materialov Pri Negarmonicheskom Nagruzhenii),
by L. S. Priss. 28 Feb 61, 16p. incl. illus. table (Trans. no. MCL-820 of Vysokomolekulyarnye Soyedineniya 2:pp. 1309-1319, 1960)
Unclassified report

DESCRIPTORS: *Materials, Viscosity, Elasticity, *Polymers, Mechanical properties, Stresses, Load distribution, Deformation, Internal friction, Relaxation time, USSR, Theory, *Elastomers, *Dynamics.

Terminology for periodic non-harmonic loading conditions is described and a selection is made for proper characteristics defining the dynamic elasticity and mechanical losses in the material during non-harmonic loading. Expressions were obtained for the dynamic modulus and for the modulus of internal friction of viscoelastic materials, the properties of which are described by a tri-elemental model and a model with continuous relaxation time spectrum. An analysis was made of the nature of stress/time dependencies corresponding to various conditions of non-harmonic change in deformation. Graphic dependencies are given for a series of concrete cases. An analysis was made of the influence of various parameters of the non-harmonic condition: duration of intermissions, ratios between duration of intermissions, asymmetry of the cycle with respect to time and sign, magnitude of the plateau and curvature of impulse front on the magnitude of mechanical losses in the material, the properties of which are described by a model with continuous relaxation time spectrum. (Author)

AD-258 489 Div. 25
(21 June 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MOTION OF AN ELECTRIC ARC IN A MAGNETIC FIELD,
by O. B. Bron. 9 Mar 61, 60p. incl. illus. (Trans. no. MCL-824 of Gosudarstvennoye Energeticheskoye Izdatel'stvo, Moscow-Leningrad:pp. 3-47, 1944)
Unclassified report

DESCRIPTORS: *Electric arcs, *Magnetic fields, Motion, Electrodes, Photographic analysis, High speed photography, Circuit breakers.

Contents:
Extinction of an electric arc by a magnetic field
Different forms of arc motion
Apparatus for high-speed photography
Mechanical expansion of an arc
Arc motion between parallel electrodes
Arc motion across horn-shaped electrodes
Magnetic expansion of an electric arc
Comparison of the effect of the normal component of the arc velocity in the magnetic field with the effect of air blow-out
Forces acting on an arc located between two parallel busbars
Survey of the principal literature on the question of the motion of an arc in a magnetic field

AD-258 494 Div. 25
(21 June 61) OTS price $2.60

Aerospace Technical Intelligencp Center, Wright-Patterson Air Force Base, Ohio.
HEAT POWER ENGINEERING (SELECTED ARTICLES).
27 Feb 61, 23p. incl. illus. tables (Trans. no. F-TS-9959 of Teploenergetika 4:pp. 63-68, 79-80, Apr 58)
Unclassified report

DESCRIPTORS: *Heat transfer, Turbulent flow, *Liquids, Pipes, Temperature, *Thermal conductivity, Convection, USSR, Integral equations.

Contents:
On heat exchange at turbulent flow of liquid in pipes
Analysis of experimental data for variable viscosity
Considering the effect of unsteady conditioning during convective heat exchange

AD-258 531 Div. 25, 14
(27 June 61) OTS price $6.60

Carbon Research Lab., U. of Buffalo, N. Y.
INVESTIGATION OF ELASTIC AND THERMAL PROPERTIES OF CARBON-BASE BODIES,
by S. Mrozowski, J. F. Andrew and others. Rept. for July 59-Oct 60 on Ceramic and Cermet Materials. Feb 61, 54p. incl. illus. tables.
(Contract AF 33(616)5186, Proj. 7350)
(WADC TR 58-360, pt. 3) Unclassified report

DESCRIPTORS: *Graphite compounds, *Carbon compounds, Thermodynamics, Elasticity, Thermal conductivity, Thermal diffusion, Deformation, High temperature research, Heat treatment, Physical properties, Temperature, Tests, Measurement, Ceramic materials.

Elastic properties and permanent set were investigated at room temperature for carbons made of graphitized filler (soft and hard) and for carbons impregnated in the baked or graphitized state in dependence on the heat-treatment temperature. An apparatus for study of deformation at high temperatures (1000 - 3000 C) was built and calibrated. Results for the variation of Young's modulus with ambient temperature were reported. Another improved apparatus for studies of heat conductivity at high temperatures was finished and also put into operation. Studies of corrections to the heat conductivity due to convection by gas across the pores were made and it is shown that such corrections are necessary even in the case of quite dense carbons. Transverse heat diffusivity was investigated in the range 700 - 2800 C by a transient state method, using a newly constructed apparatus; good fit with previously found data in the low temperature range is obtained. A general discussion of the aims of the project is included. (Author)

AD-258 536 Div. 25, 17
(27 June 61) OTS price $1.00

Columbia U., New York.
FORCED VIBRATIONS OF SANDWICH STRUCTURES,
by Alfred M. Freudenthal and Maciej P. Bieniek. Rept. for Feb-Oct 60 on Metallic Materials. Jan 61, 30p. incl. illus. tables.
(Contract AF 33(616)7042, Proj. 7351)
(WADD TR 60-307) Unclassified report

DESCRIPTORS: *Sandwich construction, *Sandwich panels, Honeycomb cores, Cylindrical bodies, Vibration, Deformation, Stresses, Shear stresses, Load distribution, Theory, Mathematical prediction, Mathematical analysis, Equations, Mechanical properties, Structures.

A method is presented for the determination of the frequency response functions of the components of deformation and of stress in orthotropic sandwich plates. It applies to the case of simply supported rectangular plates loaded by dynamic pressure normal to their planes. A similar method is presented for orthotropic sandwich cylindrical shells. The boundaries of the shell are assumed as simply supported, and the dynamic pressure is normal to the middle surface. In both problems, the analysis takes into account the transverse shear deformation of the core and the material damping of core and facings. The results are presented in the form of expressions suitable for numerical evaluation. (Author)

AD-258 545 Div. 25, 4
(27 June 61) OTS price $10.10

Anorganisch Chemisch Laboratorium, Amsterdam (Netherlands).
FIFTH EUROPEAN CONGRESS ON MOLECULAR SPECTROSCOPY 29 MAY-3 JUNE 1961, AMSTERDAM. ABSTRACTS.
1961, 127p. incl. tables, 167 refs.
(Contract DA 91-591-EUC-1754)
Unclassified report

DESCRIPTORS: *Molecular spectroscopy, *Raman spectroscopy, *Infrared spectroscopy, Organic compounds, *Ultraviolet spectroscopy, Proton transfer, Molecules, Absorption, Nuclear states, Hydrogen, Chemical bonds, Complex ions, Molecular association, Crystal structure, Microwave spectroscopy, Nuclear magnetic resonance, Molecular rotation, Fluorescence, Luminescence, Electron transitions, Molecular structure, *Symposia.

Abstracts of papers given at the Congress on Molecular Spectroscopy are presented in 2 sections: (1) general and introductory lectures (17 abstracts), and (2) short papers (150 abstracts). Some of the abstracts are presented in the French or German language. An author index is included which is arranged alphabetically and indicates after each name the abstract number.

AD-258 550 Div. 25, 8
(30 June 61) OTS price $3.60

Microwave Lab., Stanford U., Calif.
THE USE OF THE DISPLACEMENT VECTOR IN ELECTROMAGNETIC THEORY,
by Kent G. Dedrick and Robert N. Wilson. Apr 61, 33p. incl. illus. (ML rept. no. 814)
(Contract Nonr-22548, Proj. NR 373-361)
Unclassified report

DESCRIPTORS: *Electromagnetic theory, Integrals, Integral transforms, *Electric potential, *Electrostatic fields, Electron tubes, Hydrodynamics, Elasticity, Density, *Electron beams, Electromagnetic fields, Vector analysis.

Problems in the electrodynamics of charged fluids often require calculation of the charge and current densities, given prior knowledge of the initial distributions and the displacement vector field. In this paper, solutions are obtained for these new distributions, with the property that if the initial distributions have a sharply defined boundary, terms arise which can be interpreted as distributions of electric charge and current multipoles located on the initial boundary surface. These solutions can not be considered valid near the initial boundary, but prove to be useful in that many of their properties are given correctly. The electromagnetic potentials due to the charge and current densities in the displaced configuration are calculated, and form the basis for a discussion of the complicated boundary value problem encountered in the description of the electrodynamics near the boundary surface. The results are directly applicable to the theory of high frequency electron tubes, and certain formulae are of use in hydrodynamics and elasticity. (Author)

AD-258 554 Div. 25, 9
(27 June 61) OTS price $8.60

Institute of Aerophysics, U. of Toronto (Canada).
MEASUREMENT OF ROTATIONAL TEMPERATURE, VIBRATIONAL TEMPERATURE, AND MOLECULE CONCENTRATION, IN NONRADIATING FLOWS OF LOW DENSITY NITROGEN,
by E. P. Muntz. Apr 61, 54p. illus. tables.
(UTIA rept. no. 71)
(AFOSR TN 60-499)
Unclassified report

DESCRIPTORS: *Superaerodynamics, *Nitrogen, Molecules, *Temperature, Density, Measurement, Dissociation, Electron beams, *Spectroscopic analysis, Gas flow, Molecular rotation.

A method was developed for measuring rotational temperature, vibrational temperature, and molecule concentration, in nonradiating flows of low density nitrogen. The method involves the passing of a narrow beam of high energy electrons through the flow. The beam electrons excite a relatively strong emission from the first negative system of the nitrogen molecular ion $N_2(+)$. The rotational and vibrational temperatures, as well as number density, of the ground state nitrogen molecules can be inferred from observations of the beam excited first negative system. Particular emphasis was placed on the measurement of rotational temperature. A theoretical prediction was made of the relative intensities of the rotational lines in the first negative system. The prediction of the relative intensities, as a function of the rotational temperature of the ground state molecules, was checked experimentally and found to apply to within the accuracy of the experiments (+ or -2% for rotational temperature measurements). (Author)

AD-258 555 Div. 25
(27 June 61) OTS price $1.60

Illinois U., Urbana.
STRESSES DUE TO ROTARY INERTIA FORCES IN A HOLLOW CIRCULAR CYLINDER,
by H. B. Wilson, Jr. Interim technical rept. no. 2 on An Analysis of the Motion of Missiles.
May 61, 14p. incl. illus. (T.& A.M. rept. no. 190)
(Contract DA 11-022-506-ORD-3488, Proj. TW-205)
Unclassified report

DESCRIPTORS: *Cylindrical bodies, *Elastic shells, Elasticity, Rotation, Stresses, Mathematical analysis, Complex variables, Deformation, Integral equations, Mechanics.

A solution is obtained by complex variable methods for the stresses and displacements due to inertia forces in a hollow circular cylinder which rotates about an axis parallel to the longitudinal axis of the cylinder. The cylinder is assumed to be in plane strain with zero stress at the internal boundary and zero displacement at the external boundary. Numerical calculations are given for the stresses on the external boundary when Poisson's ratio equals 1/2. (Author)

AD-258 556 Div. 25, 7
(27 June 61) OTS price $2.60

Cruft Lab., Harvard U., Cambridge, Mass.
ON THE BORN-LERTES ROTATIONAL EFFECTS,
by William F. Pickard. 10 Apr 61, 24p. incl. illus. 24 refs. (Technical rept. no. 339)
(Contract Nonr-186632, Proj. NR-371-016)
Unclassified report

DESCRIPTORS: *Torque, *Dielectrics, Rotation, *Electrostatic fields, Electrostatic generators, Electric potential, Electromagnetic fields, Cylindrical bodies, Mathematical analysis.

A unified theoretical treatment of the Born-Lertes rotational effect is presented for the special case of a system of two concentric cylinders. It is shown that both the Born and the Lertes effects arise naturally from the concepts of dielectric loss and effective conductivity. A typical theoretical curve is given for the variation of the torque with frequency. (Author)

AD-258 566 Div. 25, 9
(27 June 61) OTS price $15.50

Michigan U. Coll. of Engineering, Ann Arbor.
ACCELERATION OF PLASMAS BY INDUCTIVELY GENERATED ELECTROMAGNETIC FIELDS,
by David B. Miller. Final rept. Apr 61, 220p. incl. illus. tables (Rept. no. 02836-10-F)
(Contract 19(604)4557)
(AFCRL-462) Unclassified report

DESCRIPTORS: *Plasma physics, Electromagnetic fields, *Particle accelerators, Particle trajectories, Acceleration, Mathematical analysis, Electromagnetic effects, *Magnetohydrodynamics, Analog computers, Digital computers, Helium, Argon, Plasma jets.

The theory and experimental behavior of an induction electromagnetic accelerator are presented. The induction accelerator, one example of a general class of electrical systems which can be used to accelerate charged particles and ionized gases, employs a time-varying current in a coil to generate the force-producing electric and magnetic fields. The application of the induction accelerator for space propulsion is of particular interest. (Author)

AD-258 567 Div. 25, 17
(27 June 61) OTS price $1.25

Manufacturing Labs., Inc., Cambridge, Mass.
SURFACE TENSION OF REFRACTORY METALS,
by S. Victor Radcliffe and H. Udin. Rept. for 25 Jan 59-30 June 60. Dec 60, 37p. incl. illus. table, 45 refs.
(Contract AF 33(616)6269, Proj. 7351)
(WADD TR 60-566) Unclassified report

DESCRIPTORS: Refractory materials, *Surface tension, *Niobium, Solids, Heating, Electron bombardment, Determination, Theory, Mathematical analysis, Tungsten, Molybdenum, Metals, Creep, Stresses, Deformation, Measurement, Test methods, Test equipment.

An electron-bombardment heating technique has been applied to the measurement of the surface tension of solid Nb by a modification of the Udin (Surface tension of refractory metals, WADD-1960) method. The value obtained is 2100 dynes/cm at 2250 C in a vacuum of approximately 0.00001 mm. This result is consistent with a theoretical estimate and provides support for Taylor's estimates of the surface tension of the refractory metals. From measurements of the dihedral angle of grain boundaries formed in niobium by thermal etching, the interfacial energy was computed to be 0.36 of the surface energy. An electrical-resistance heating technique has been applied to the measurement of the surface tension of solid tungsten, molybdenum and niobium by a modification of the Udin method. The method in this form was found to be unsuitable for these metals. (Author)

AD-258 590 Div. 25, 8
(26 June 61) OTS price $5.60

Shockley Transistor Corp., Palo Alto, Calif.
MEASUREMENT OF PHONON SCATTERING IN SILICON,
by Kurt Hubner. Technical rept. for 1 June 59-1 Feb 61 on Research on Semiconductor Transport. 1 Feb 61, 53p. incl. illus. tables, 32 refs.
(Contract Nonr-293400)
Unclassified report

DESCRIPTORS: *Phonons, *Scattering, Silicon, Crystals, *Single crystals, Lattices, High frequency, Propagation, Tests, Dioxides, *Semiconductors, Electric fields, Silicon compounds, Measurement, Electron transitions, Theory.

The electrical coupling by phonons of 2 isolated layers provides a new method which is used to study the propagation properties of phonons in single crystal silicon at a temperature of 77 K. Measurements are given for phonon scattering by holes, dislocations and oxygen precipitates, with a simple analysis of the results on phonon-phonon scattering. (Author)

AD-258 594 Div. 25
(27 June 61) OTS price $1.60

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THE APPLICATION OF COMPUTER TECHNIQUES TO PREFERRED ORIENTATION STUDIES,
by J. R. Holland. Rept. for Jan-June 60 on Metallic Materials. Dec 60, 13p.
(Proj. 7351)
(WADD TN 60-242) Unclassified report

DESCRIPTORS: *Crystal structure, Crystals, *Metallic crystals, *X-ray diffraction analysis, *Programming, Computers, Digital computers, Copper compounds, Solid state physics, Mathematical analysis.

A computer technique for plotting normalized pole figures is described and an illustration of the technique applied to data generated using Schulz reflection x-ray diffraction geometry is presented. The computer method enhances the accuracy of the x-ray data and is far less tedious than the usual manual methods of plotting normalized pole figures. Somewhat modified programs should be capable of utilizing data generated by other diffraction geometries commonly used in quantitative preferred orientation studies, thus the method is more versatile than a specialized, completely automatic pole figure plotter. (Author)

AD-258 603 Div. 25, 7, 14
(27 June 61) OTS price $1.60

Titanium Alloy Mfg. Div., National Lead Co.
Niagara Falls, N. Y.
THERMOELECTRIC MATERIALS,
by Merton H. Brooks. Bimonthly progress rept. no. 6, 1 Nov-31 Dec 60. 18 Jan 61, 4p. tables.
(Contract NObs-78326)

Unclassified report

DESCRIPTORS: *Thermoelectricity, Materials, Cerium compounds, Oxides, Dioxides, Zirconium compounds, Ceramic materials, Refractory materials, Electrical properties, *Semiconductors, Thermal conductivity, Resistance, Measurement, Instrumentation, *Electric power production, Niobium compounds, Niobates, Design.

Formulations were calculated for additions to CeO2 and for synthesis of the four ABO4 niobates. ZrO2 solid solutions, plus additions, were formed and fired. The green bars were formed at 10,000 psi for 5 sec; sintering was accomplished in a gas-fired, down-draft kiln over a 24-hr cycle. Using the Skinner Thermal Conductivity Comparator in modified form, an attempt was made to set up standard reference curves of delta T vs T for the reference standards furnished by NRL. The Seebeck Coefficient, as a function of temperature, was determined on the Nb205 Standard Series of additions to cubic ZrO2 stabilized by Y203. (Author)

AD-258 604 Div. 25, 7, 14
(27 June 61) OTS price $1.60

Titanium Alloy Mfg. Div., National Lead Co.,
Niagara Falls, N.Y.
THERMOELECTRIC MATERIALS,
by Merton H. Brooks. Bimonthly progress rept. no. 7, 1 Jan-28 Feb 61. 15 Mar 61, 4p. incl. tables.
(Contract NObs-78326)

Unclassified report

DESCRIPTORS: *Thermoelectricity, Materials, Titanium compounds, Dioxides, *Electric power production, Oxides, Ceramic materials, Electrical properties, Thermal conductivity, Resistance, Instrumentation, Measurement, Niobium compounds, Niobates, Zirconium compounds, Semiconductors, Design.

Standard ceramic bodies were prepared of all standard series of additions to TiO2. A programer was constructed to produce a controlled linear heating rate in the furnace of the Skinner Thermal Conductivity Comparator. Equipment and circuitry for electrical measurements were improved. The measuring system was doubled in capacity. Standard reference curves of delta T vs T were established. The Seebeck coefficient was determined as a function of temperature on the following standard series: (1) cubic ZrO2-7 m/o Y2O3 solid solution plus La2O3 additions; (2) cubuc ZrO2-15 m/o CaO solid solution plus Nb2O5 additions; and (3) cubic ZrO2-15 m/o CaO solid solution plus La2O3 additions. Nb2O5 was more effective than La2O3 in increasing the Seebeck effect in cubic ZrO2 solid solutions.

AD-258 610 Div. 25
(26 June 61) OTS price $4.60

Battelle Memorial Inst., Columbus, Ohio.
SOLID STATE PROPERTIES OF NON-CONDUCTING MATERIALS OF SIMPLE MONATOMIC AND DIATOMIC SPECIES.
Special technical and Scientific rept. no. 1, 1 Oct-31 Dec 60. 30 Jan 61, 38p. incl. illus. tables.
(Contract DA 91-591-EUC-1591)

Unclassified report

DESCRIPTORS: *Solid state physics, Nitrogen, *Conductivity, *Rare gases, Stability, Low temperature research, Atomic structure, Molecules, Crystal structure, Atoms, Argon, Quadrupole moments, Perturbation theory, Lattices, Cryogenics.

Research is being conducted on the stability of crystal structure of the heavy rare gas atoms, particularly the effect of many-body forces. Analysis into the crystal field in solid argon is made to test the hypothesis that the diatomic term in the exchange expansion causes 2 neighboring atoms in the crystal to behave like a diatomic molecule and that the diatomic unit possesses a permanent quadrupole moment comparable in size to nitrogen; quantitative conclusions were not possible concerning this calculation. Analysis with different angle-dependent potentials is made concerning the types of many-body effect required to render the face-centered-cubic structure more stable than the hexagonal close-packed lattice. The 3-body forces between rare gas atoms which occur in the first order of perturbation theory are discussed. Three triangular configurations are considered: an equilateral triangle, a 120 degree configuration, and a linear symmetric array. Preliminary results indicate that for an equilateral triangle the interactions are less repulsive than calculated on the basis of 3 isolated pairs whereas for the linear array they are more repulsive. Texts are reproduced of lectures on (1) Validity of the assumption of 2-body forces in molecular physics, Oct. 20, 1960, and (2) On the validity of crystal structures of the rare gases.

AD-258 611 Div. 25
(26 June 61) OTS price $3.60

Stockholm U. (Sweden).
THEORETICAL INVESTIGATION OF THE ELECTRONIC ENERGY BANDS FOR THE ZIRCONIUM-OXYGEN CRYSTAL.

PART II. SYMMETRY-ADAPTED ORBITALS AND SECULAR ELEMENTS,
by Stig Flodmark and Bjorn Roos. Mar 61, 36p. incl. illus. 12 refs. (Technical rept. no. 5)
(Contract DA 91-591-EUC-1391)
Unclassified report

DESCRIPTORS: *Crystals, *Solid state physics, Electronics, Energy, *Zirconium compounds, *Oxides, Mathematical analysis, Algebra, Matrix algebra, Sweden, Oxygen, Lattices, Zirconium, Atomic orbitals.

Explicit formulae for the elements of the split secular equations which yield the electronic energy bands in the close-packed hexagonal Zr-O system are presented. The methods used to split the secular equations in the present report are based on the theoretical development outlined previously (AD-257 432). Certain singular idempotent projection matrices, labelled by the diagonal elements of the irreducible representations of the different little groups of the crystal symmetry group, are very useful for the determination of the split secular matrices. These matrices are given for the case where the screw symmetry of the crystal is not considered; they are unique except for similarity transformations. A systematic method of further transforming the singular secular matrices into reduced form and, finally into real form is outlined. Some relations for the elements of the secular equations and a discussion of the influence of the screw symmetry are given. (Author)

AD-258 619 Div. 25
(28 June 61) OTS price $3.60

New Mexico State U. of Agriculture, Engineering, and Science, University Park.
THEORETICAL INVESTIGATION OF ELECTRON ORBITS AND BREMSSTRAHLUNG IN A PLASMA,
by Otto H. Theimer. Jan 61, 37p.
(Contract N9onr-95307)
Unclassified report

DESCRIPTORS: *Bremsstrahlung, *Electron transitions, *Plasma physics, Theory, Quantum statistics, Statistical distribution, Probability, Fourier analysis, Series.

A new method for calculating the partition function of real gases is developed and applied to the case of a plasma. The electrostatic energy is represented as a function of the Fourier coefficients of the particle density and, with the coefficients as independent variables, the configuration integral is evaluated by direct integration. A zeroth order approximation is obtained in this fashion which approaches the correct value just in the cases of low temperature and high ion density which cannot easily be handled by standard methods. In these cases the absolute value of electrostatic energy is found smaller, by 29%, than the familiar Debye-Huckel energy. (Author)

AD-258 625 Div. 25, 26
(28 June 61) OTS price $1.60

Texas Instruments, Inc., Dallas.
RESEARCH AND DEVELOPMENT OF YTTRIUM IRON GARNET SINGLE CRYSTALS,
by L. L. Abernethy, T. S. Burkhalter, and G. K. Teal. Interim engineering rept. no. 8, 1 Jan-31 Mar 61. 17 May 61, 17p. incl. illus.
(Contract NObsr-77571)
Unclassified report

DESCRIPTORS: *Yttrium compounds, *Garnet, *Single crystals, Growth, *Iron compounds, Crystals, *Ferromagnetic materials, Rare earth compounds, Zone melting, Impurities, Production, Gallium, Gadolinium, Samarium, Rare earth elements, Oxides.

Yttrium iron garnet (YIG) single crystals 1/4 to 3/8 in. diameter with about 10 dielectric constant and 0.002 dissipation were produced by the floating zone technique. Ferrimagnetic resonance line widths of 1 to 2 oersteds were obtained from polished test spheres. Successful experiments with Ga, Gd, and Sm-substituted YIG demonstrated the feasibility of the same technique for growing gallium or rare earth-substituted garnets. Experiments with YIG indicate that the floating zone technique can be modified to use oxygen pressure to 25 atm, automatic control of temperature and zoning rate, and an effective growth rate of at least 0.20 in./hr. YIG crystals 1/2 in. in diameter by 1 in. in length can be produced by improved techniques. (Author)

AD-258 632 Div. 25
(28 June 61) OTS price $3.60

Materials Research Lab., U. of Calif, Berkeley.
THE EFFECT OF SURFACE TREATMENT ON THE BENDING CHARACTERISTICS OF MgO SINGLE CRYSTALS,
by Lawrence David Johnson and I. Cornet. May 61, 1v. incl. illus. tables (Technical rept. no. 3; Series no. 162, Issue no. 3)
(Contract Nonr-22267)
Unclassified report

DESCRIPTORS: *Single crystals, *Surface properties, Fracture (Mechanics), Deformation, Deflection, Stresses, Fatigue (Mechanics), Plasticity, Statistical analysis, Surfaces, Cleaning, *Magnesium compounds, Oxides, Plastic flow, Crystals, Lattices.

As-cleaved specimens of MgO which were chemically polished in phosphoric acid, acetic acid, ammonium acetate, and distilled water exhibited on bending in air a sudden load drop phenomenon. This effect was believed to be associated with the removal of mobile surface dislocation half-loops by the environment. Specimens of MgO which were fatigue strained and then polished in phosphoric acid did not exhibit the load drop effect. Fatigue straining before polishing introduced many mobile dislocations which were not removed by polishing. Specimens of MgO which were alternately deflected 0.02 in. in bending and polished in phosphoric acid exhibited greater deflection than as-cleaved specimens. (Author)

AD-258 650 Div. 25, 8, 15
(28 June 61) OTS price $3.60

Electronic Defense Labs., Mountain View, Calif.
ON SCATTERING OF WAVES BY TWO OBJECTS,
by Victor Twersky. 6 Mar 61, 29p. incl. illus. (Engineering rept. no. EDL-E60)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Scattering, Special functions, Series, *Electromagnetic waves, Electromagnetic fields, *Integral equations, Matrix algebra, *Cylindrical bodies, Operators (Mathematics), Electromagnetic wave reflections, Transformations (Mathematics), Surfaces.

A self-consistent system of integral equations is derived to specify the multiple scattering amplitudes for many objects in terms of corresponding

functions for the isolated objects. For arbitrary configurations and large spacings, the amplitudes are expanded as an asymptotic series of single scattered functions; closed forms involving differential operators are derived for two objects. For arbitrary spacings, the amplitudes are expanded as Fourier of Mathieu series to obtain algebraic sets of equations relating the multiple and single scattering coefficients. Series expansions are obtained for arbitrary configurations, and closed forms are given for two small objects. (Author)

AD-258 689 Div. 25, 1, 14
(28 June 61) OTS price $4.60

Douglas Aircraft Co., Inc., El Segundo, Calif.
SONIC FATIGUE DAMPING SYSTEM DEVELOPMENT,
by D. G. Smillie. Quarterly rept. no. 1, 4 Apr-1 July 60. 1 July 60, 43p. incl. illus. 28 refs.
(Rept. no. ES-29926)
(Contract NOa(s) 60-6072-c)
Unclassified report

DESCRIPTORS: Sound, *Damping, *Airframes, *Cantilever beams, Vibration, Airplane panels, Sheets, Coatings, *Rubber coatings, *Elastomers, Adhesion, Aluminum alloys, Polymers, Materials, Fatigue (Mechanics), Absorption, Jet acoustic oscillation, Viscosity, Elasticity, Test facilities, Test methods, Instrumentation, Strain gages, Temperature, Acoustic insulation, *Vibration isolators, Plastic coatings.

A literature search was made to survey commercially available damping and adhesive materials and to determine the physical properties of those materials which reduce resonant-stress. Damping ratios of 108 uncoated strip specimens have been measured and recorded. A load-stress curve has been plotted for 30 uncoated panel-stiffener adhesion test specimens. Thirty viscoelastic materials have been acquired. Coupons of these materials have been prepared for peel strength and environmental tests. Investigation of the high-temperature strain gauge techniques required for the program has been initiated. (Author)

AD-258 699 Div. 25, 20
(28 June 61) OTS price $1.60

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
CHEMICAL AND CATALYTIC CHEMICAL REACTORS FOR HEATING OR COOLING AVIONIC EQUIPMENT,
by A. R. Saltzman. Technical note. 9 June 61, 15p. incl. illus. (Rept. no. NADC-EL-N6133)
Unclassified report

Presented as a Paper at the Fifth Navy Science Symposium by A. R. Saltzman on 20 Apr 61 at the U. S. Naval Academy. Sponsored by the Office of Naval Research.

DESCRIPTORS: Electronic equipment, Cooling, Heating, *Homogeneous reactors, *Heterogeneous reactors, *Reaction kinetics, *Heat transfer, Theory, *Reactor kinetics, Chemical reactions, Catalysts, Heat exchangers, Aircraft equipment.

An investigation is being made of the application of chemical reactors for cooling and heating equipments to be used in high-speed naval air and space craft. A brief discussion is presented of the basic theory of chemical and catalytic reactors, and an outline is given of the various types of operations. Heat transfer aspects of reactor design are emphasized. For illustrative purposes, a specific chemical reactor cooling problem is defined. A comparison is made of the heat capacity property of a coolant vapor as used in a conventional heat exchanger and in a chemical reaction process. A larger amount is shown to be dissipated as heat per degree temperature rise due to the better heat capacity of the reaction system.

AD-258 719 Div. 25, 4
(29 June 61) OTS price $1.60

Santa Clara U., Calif.
THE MAGNETIC SUSCEPTIBILITIES OF CRYSTALLINE STABLE FREE RADICALS IN THE 77 - 293 DEGREES K. TEMPERATURE RANGE,
by William Duffy, Jr. 1 June 61, 12p. illus.
(Technical rept. no. 1)
(Contract Nonr-298501, Proj. NR 018-203)
Unclassified report

DESCRIPTORS: *Free radicals, Crystals, Magnetic properties, Low temperature research, *Magnetic susceptibility, Measurement, Paramagnetic resonance, Microbalances.

The powder susceptibilities of crystalline stable free radical samples of Wurster's blue, DPPH and 1,3-bisdiphenylene-2-phenylallyl have been measured as a function of temperature from 77-293 K. All exhibit negative Curie points with values in the range -36 K to -6 K. For Wurster's blue, the Neel temperature is found to be 186 K. The microbalance system constructed for the measurements is described. (Author)

AD-258 737 Div. 25, 9
(30 June 61) OTS price $3.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE USE OF A T-TUBE TO PRODUCE SHOCK-HEATED PLASMAS IN AN X-BAND WAVEGUIDE,
by J. M. Schecher. Apr 61, 38p. incl. illus.
(Technical note no. BN-245)
(Contract AF 49(638)401, Proj. 9781)
(AFOSR-757)
Unclassified report

DESCRIPTORS: *Plasma physics, Waveguides, X-band, *Shock tubes, Electric discharges, *Shock waves, Range, Tests, Rotating drum cameras.

The shock wave produced by a T-tube with a side-arm expansion tube of 10-mm square cross section is investigated in order to determine whether it might be used to produce shock-heated plasmas in an X-band waveguide. Only weak shocks of Mach number less than 15 in argon at ambient pressures from 0.12 mm to 2 mm of mercury was studied. The investigation has two aspects. The theoretical and experimental results obtained by previous studies of strong shocks in T-tubes are applied to our tube where it is possible. Experimental studies were also made on the tube. At Mach numbers less than 16 the velocity of the shock front varies as the inverse square of the initial pressure and as the square of the applied voltage. The maximum volume of the shock-heated test plasma is found by theoretical considerations to be less than 1.2 c.c. Drum camera pictures reveal the presence of additional fronts which

move slightly faster than the shock front itself. Several shocks are produced by the ringing of the discharge circuit. A summary is given of the knowledge of the thermodynamic variables of the test gas behind the shock front which can be obtained from drum camera photographs. (Author)

AD-258 756 Div. 25, 4
(29 June 61) OTS price $1.60

New York U., N. Y.
THERMOELECTRIC PROPERTIES OF THE SILVER NITRATE/SODIUM NITRATE SYSTEM,
by Ralph Schneebaum and Benson Ross Sundheim.
Technical rept. 19 June 61, 8p. incl. illus. table, 10 refs.
(Contract Nonr-28537)
Unclassified report

DESCRIPTORS: *Silver compounds, *Sodium compounds, *Nitrates, *Thermoelectricity, Electrical properties, Electrolytes, Liquids, Solutions, Electrolytic cells, Transport properties, Electrical conductance, Voltage, Measurement.

The determination of the initial thermal emf at 310 C in the system Ag(T sub 1)/AgNO3, NaNO3/Ag(T sub 2) is described for the complete composition range. The thermoelectric power of pure AgNO3 (319 v/degree C) falls off slightly as the mole fraction of AgNO3 decreases and then rises sharply in dilute solutions. Extrapolation towards zero mole fraction of AgNO3 gives a value of 797 v/degree C. The phenomenological equations are presented in a form well suited to the study of liquid electrolytes. For systems with the particularly simple transference properties of this system, the initial emf is equal to the heat of transport for interdiffusion + the Peltier heat in the Soret steady state/T. The present results can be combined with the forthcoming Soret effect data to give the heat of diffusional transport and the entropy of the moving iron. (Author)

AD-258 763 Div. 25
(29 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
MAGNETIC IGNITION OF PULSED GAS DISCHARGES IN AIR OF LOW PRESSURE IN A COAXIAL PLASMA GUN,
by Karlheinz Thom and Joseph Norwood, Jr.
June 61, 32p. incl. illus. (NASA Technical note D-910)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-910.

DESCRIPTORS: *Plasma jets, *Gas discharges, Magnetic fields, Plasma physics, Electrodes, *Ignition, Capacitors, Electric propulsion, Nuclear propulsion, Electric discharges, Electron guns, Ions, Electrons, Helixes, Switching circuits, Pulse generators, Coaxial cables, Space charges, Magnetohydrodynamics.

The effect of an axial magnetic field on the breakdown voltage of a coaxial system of electrodes was investigated. For low values of gas pressure times electrode spacing, the breakdown voltage is decreased by the application of the magnetic field. The electron cyclotron radius now assumes the role held by the mean free path in nonmagnetic discharges and the breakdown voltage becomes a function of the magnetic flux density. The dependence of the formative time lag as a function of the magnetic flux density is established and the feasibility of using a magnetic field for igniting high-voltage, high-current discharges is shown through theory and experiment. With a 36 microfarad capacitor bank charged to 48,000 volts, a peak current of 1.3 x 10 to the 6th power amperes in a coaxial type of plasma gun was achieved with a current rise time of only 2 microseconds. (Author)

AD-258 771 Div. 25, 8
(29 June 61) OTS price $9.60

Palo Alto Labs., Calif.
ENERGY TRANSFER IN PLASMAS.
Final rept. 15 Apr 59-25 Feb 61. 10 Apr 61, 104p. incl. illus.
(Contract AF 30(602)2050, Proj. 5561)
(RADC TR 61-110) Unclassified report

DESCRIPTORS: *Plasma physics, Energy, Electromagnetic waves, Temperature, Propagation, *Gas ionization, Microwaves, Electrons, Density, *Interferometers.

Problems associated with energy transfer mechanisms in a plasma are described. Relaxation effects, nonlinear effects, and transport effects, are considered. These effects are significant only when a longitudinal component is present in the wave motion. A theoretical treatment is given for propagation in a non-uniform plasma, and approximation techniques developed for various plasma profiles. The case of linear variation of the electron density with density is treated in detail. Computer data indicate that under proper conditions large absorption occurs even for a relatively steep rise in the electron density. Measurements in a shock tube using an interferometer at 18 kmc indicate that under certain conditions a shock wave is preceded by large numbers of electrons and that the electron density profile is smoothly tapered. Techniques for producing a prescribed non-uniform plasma were studied. An electrodeless discharge vessel with moving Langmuir probes was designed and a systematic comparison was made between microwave and probe measurements. In spite of certain systematic pressure-dependent deviations, with proper calibration, the probe method can be applied to the measurement of non-uniform plasmas. An experimental program for the measurement of the thermal conductivity in a plasma by acoustic techniques was unsuccessful because of noise and instabilities in the plasma. (Author)

AD-258 773 Div. 25
(29 June 61) OTS price $16.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
RADIATION FROM A POINT SOURCE IN AN ANISOTROPIC MEDIUM,
by E. Arbel. Doctoral thesis. 2 Nov 60, 230p. incl. illus. (Research rept. no. PIBMRI-861-60)
(Contract AF 19(604)4143)
(AFCRL-303) Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, *Propagation, Numerical methods and procedures, *Magnetohydrodynamics,

Optics, Mathematical analysis, Differential equations, Vector analysis, Calculus of variations.

A procedure is presented for the derivation of formal solutions to the problem of radiation from finite sources in the presence of gyrotropic regions. The boundary surfaces between adjacent gyrotropic regions constitute a set of parallel planes. The gyrotropic axis is perpendicular to the boundary planes. The above procedure is applied to the problems of radiation from a current element in an infinite and a semi-infinite plasma region. In both cases, the current element is oriented along the direction of the dc magnetic field. Asymptotic expressions for the far field are derived by application of the saddle point method. In the case of an infinite plasma region with an infinite dc magnetic field, explicit expressions are derived which are valid everywhere in space. In the case of an infinite plasma region, the radiation field due to a point source consists of several ray contributions. At the vicinity of a given observation point, each ray contribution behaves like a plane wave whose power flow is directed along the straight line from the point source to the observation point. (Author)

AD-258 779 Div. 25, 8, 30
(29 June 61) OTS price $5.60

Utah U., Salt Lake City.
MICROWAVE CAVITY MEASUREMENTS OF IONIZATION IN THE TRAIL OF HIGH VELOCITY PELLETS,
by D. K. Gehmlich, R. W. Grow, and D. R. Harrison.
Interim technical rept. no. 13 on Investigation of Ionization Associated with Ultra-Speed Pellets.
31 Oct 59, 50p. incl. illus. tables.
(Contract DA 04-495-ORD-451, Proj. TB2-0001(845))
Unclassified report

DESCRIPTORS: *Gas ionization, *Hypervelocity projectiles, Measurement, Instrumentation, Pellets, *Cavity resonators, Ionization, Ions, Density, Microwaves.

The ionization density of the ion trail following a high speed cylindrical aluminum pellet with a length of 0.187 in. and with a diameter of 0.220 in. was measured. The pellet was fired through a resonant microwave cavity. The change in the resonant frequency of the cavity was observed when the ion trail was within the cavity. Ion densities between 10 to the 13th and 14th power per cubic centimeter were measured for pellet velocities between 1.7 and 2.1 kilometers per second at a distance of 30 cm from the end of the gun barrel. Ion densities between 1 and 3 x 10 to the 13th power per cubic centimeters were measured for velocities between 1.9 and 2.1 kilometers per second at 73 cm down range. The diameter of the ion stream was found to be about 2 inches. Within the range of velocities cited, the flare length was approximately proportional to pellet velocity. A measurement of the delay time between the pellet and the onset of ionization at 30 cm and 73 cm down range indicated that the ionization stream decelerates faster than the pellet. (Author)

AD-258 791 Div. 25
(30 June 61) OTS price $1.60

Flight Dynamics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A HIGH INTENSITY PULSED X-RADIATION SOURCE,
by Frank D. Adams. May 61, 12p. incl. illus.
(Technical memo. no. TM 61-3)
Unclassified report

DESCRIPTORS: *X-ray generators, *Magnetic fields, *Electrons, Injection, Design, Accelerators, *Electron accelerators, *Electron guns, Pulse generators, X-rays.

A pulse magnetic x-ray device capable of generating high intensity x-radiation is considered. Such a device will employ high energy electrons from a linear accelerator injected into a pulsed megagauss magnetic field. For a specified spectrum (characterized by the critical wavelength), flux level, electron beam width, and observation range, the required parameters, magnetic field intensity, electron energy, and number of electrons may be approximately determined. (Author)

AD-258 801 Div. 25, 2
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
COEFFICIENT OF DILUTION IN CALCULATIONS OF THE RADIATION PRESSURE OF SUN (Koeffitsient Dulutsii Pri Podschetakh Luchevogo Davleniya),
by S. V. Orlov. Mar 61, 4p. (Trans. no. MCL-59 of Astronomicheskiy Zhurnal 28:219-220, 1951)
Unclassified report

DESCRIPTORS: *Astrophysics, Sun, *Blackbody radiation, *Optics, Pressure, Energy, Physics.

AD-258 814 Div. 25, 17
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A UNIFIED STATISTICAL THEORY OF STRENGTH OF SOLID BODIES,
S. D. Volkov. 17 Mar 61, 39p. incl. illus. 27 refs. (Trans. no. MCL-507 of Zhurnal Tekhnicheskoy Fiziki 23:2025-2037, 1953)
Unclassified report

DESCRIPTORS: *Solids, *Solid state physics, Theory, *Mechanics, *Fracture (Mechanics), Failure (Mechanics), Stresses, Deformation, Mechanical properties, Metallic crystals, *Metals, Mathematical analysis, Brittle materials, USSR.

The present work has as its aim the development of a unified theory of strength which can be used both in the mechanism of fracture and to derive a single set of conditions of strength which will fit all stress states. By applying statistical mechanics to a model of a quasi-isotropic single-phase polycrystal, it can be demonstrated that the modulus of distribution of volumes V of crystallites according to stresses is a function of the external load. This circumstance is utilized to provide a unified explanation of cleavage fracture caused by tension or compression of brittle bodies; the fracture occurs through the action of tensile stresses. (Author)

AD-258 826 Div. 25, 30
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW SPECTRAL MEASUREMENT METHOD WITH THE AID OF PHOTOSENSITIVE LAYERS (Novyy Sposob Spektral' Nogo Izmereniya Pri Pomoshchi Fotochuvstvitel' Nykg Sloyev),
by V. Lyuk. 17 Jan 61, 7p. (Trans. no. MCL-799 of Avtomatika i Telemekhanika 21:1084-1087, July 60).

Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Photoelectric cells, *Photosensitivity, *Infrared radiation, *X-rays, *Spectrographic analysis, Pyrometers, Photoconductivity, Test methods, *Infrared photoelectric cells, Infrared spectroscopy, Optical spectrometers.

Research is concerned with spectral measurements in the zone of visible and infrared radiations; in the case of very small values of the measured radiant energy certain difficulties arise. This problem comes up in cases where it becomes necessary to measure the intensity of a narrow frequency band because the radiation power decreases upon the narrowing of the band. (Author)

AD-258 840 Div. 25
(29 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NOTE ON THEORY OF ACOUSTIC STREAMS IN THE ENVIRONS OF HEATED SOLIDS,
by P. N. Kubanskiy. 13 Mar 61, 10p. (Trans. no. MCL-857 of Akoustichiskiy Zhurnal 6:462-467, 1960).

Unclassified report

DESCRIPTORS: *Acoustics, *Sound transmission, Heat transfer, *Solid state physics, Solids, Thermal radiation, High temperature research, Mathematical analysis, Boundary layer, Aerodynamic heating, USSR.

A modified system of equations is presented describing the phenomenon of acoustic streams, distorted by convection; the substantiation of assumptions simplifying the solution of the problem is also given. Formulas are derived for calculation of stream velocities and temperatures in the vicinity of a heated-up solid placed into an acoustic field of a high amplitude. Formulas are obtained for calculation of the heat transfer coefficient. The possibility of applying the superposition principle to acoustic and convective flows at a moderate intensity is noted. (Author)

AD-258 846 Div. 25, 9, 32
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MODERN STATUS AND PERSPECTIVE OF DEVELOPING THE SCIENCE ABOUT HEAT EXCHANGE (Sovremennoye Sostoyaniye i Perspektivy Razvitiya Ucheniya O Teploobmene),
by B. S. Petukhov. 18 Apr 61, 31p. (Trans. no. MCL-911)

Unclassified report

DESCRIPTORS: USSR, Economics, Industrial mobilization, Thermoelectricity, Electric power production, Industrial equipment, *Heat transfer, Nuclear power plants, Fluid mechanics, Thermodynamics, Hydrodynamics, Aerodynamics, Scientific research, Scientific organizations, *Heat exchangers, Research program administration.

Conclusions: To coordinate the research operations on heat exchange, the organization of mutual information and exchange of experience, it is necessary to establish at the Academy of Sciences USSR a scientific technical council on heat exchange, it should include representatives of academic and branch institutions, higher educational institutions and industry. (Author)

AD-258 849 Div. 25, 20, 30
(29 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
IMPULSE METHOD OF MEASURING THE SPECTRUM OF LIGHT IONS IN THE ATMOSPHERE,
by L. R. Tsvang. 21 Apr 61, 13p. (Trans. no. F-TS-9946 of Izvestiya Akademii Nauk, SSSR, Seriya Geofizicheskaya 2:202-209, 1956)

Unclassified report

DESCRIPTORS: Atmosphere, *Ions, Measurement, Ionosphere, *Instrumentation, Capacitors, Specific impulse, USSR, *Electrical properties, Spectrographic analysis, Meteorology, *Clouds.

A new method of measuring the spectrum of ions in the atmosphere is described; the theory is explained for a method used in the case of flat and cylindrical capacitors plus a brief description of the instruments used for such measurements. (Author)

AD-258 857 Div. 25, 15
(30 June 61) OTS price $1.60

Brown U., Providence, R. I.
ON UNIQUENESS IN LINEAR VISCOELASTICITY,
by S. Breuer and E. T. Onat. June 60, 10p.
(Technical rept. no. 23)
(Contract Nonr-56220, Proj. NR 064-424)

Unclassified report

DESCRIPTORS: *Elasticity, *Solids, *Boundary layer, Viscosity, Shear stresses, Time, Mechanics, Mathematical analysis, Stresses, Integral equations, Convex sets, Deformation.

It is shown that solutions of a class of boundary value problems in linear viscoelasticity are unique, if the relaxation moduli in shear and compression are steadily decreasing functions of time which are convex from below and tend to nonnegative constant asymptotic values. (Author)

Division 25 - PHYSICS

AD-258 860 Div. 25, 4
(30 June 61) OTS price $1.60

Convair, San Diego, Calif.
APPROXIMATE INFRARED EMISSIVITY CALCULATIONS FOR NO AT ELEVATED TEMPERATURES,
by S. S. Penner, K. G. P. Sulzmann, and C. B. Ludwig. 29 Nov 60, 14p. incl. illus. (Rept. no. ZPh-079)
(Contract DA 04-495-ORD-3112)
(ARPA Order no. 39-59, Task 2)
Unclassified report

DESCRIPTORS: Nitrogen compounds, Oxides, *Infrared radiation, Mathematical analysis, *Gases, *Molecular spectroscopy, Molecular rotation, Quantum mechanics, Absorption.

Analytical expressions are derived for the spectral and total emissivities of diatomic gases at elevated temperatures. Our analytical formulae reproduce the numerical results obtained for NO by Breene with acceptable precision. (Author)

AD-258 886 Div. 25, 4
(3 July 61) OTS price $1.60

Metcalf Research Lab., Brown U., Providence, R. I.
THE CRYSTAL STRUCTURE OF BETA-IODINE MONOCHLORIDE,
by Gene B. Carpenter and Stephanie M. Richards. June 61, 16p. incl. illus. tables (Technical rept. no. 9)
(Contract Nonr-56204, Proj. NR-017-607)
Unclassified report

DESCRIPTORS: *Iodine compounds, *Chlorides, Crystal structure, Halogen compounds, Chemical bonds, Crystals.

Beta-ICl is monoclinic, P2 sub 1/c with a equal to 8.883, b equal to 8.400, c equal to 7.568 angstroms, beta equal to 91.3 degrees and 8 molecules per cell. In beta-ICl, the molecules are arranged in zig-zag chains; the bond lengths are I-Cl equal to 2.35 and 2.44 angstroms in the 2 independent molecules. Within chains the I...I distance is 3.06 and the I...Cl distance is 2.94 angstroms; between chains the distances are much longer. These short distances indicate interactions between molecules in one chain strong enough to be called weak bonds. (Author)

AD-258 895 Div. 25
(3 July 61) OTS price $1.60

California U., Berkeley.
ASYMPTOTIC BEHAVIOUR AND SUBTRACTIONS IN THE MANDELSTAM REPRESENTATION,
by Marcel Froissart. 1958, 19p.
(Contract AF 49(638)327)
(AFOSR-781)
Unclassified report

DESCRIPTORS: Particles, *Reaction kinetics, Energy, Functions, Series, Theory.

It is proved that a two-body reaction amplitude involving scalar particles and satisfying Mandelstam's representation is bounded by mathematical expressions at the forward and backward angles and at any other fixed angle in the physical region. Restrictions limit the freedom of choice of the subtraction terms to six arbitrary single spectral functions and one subtraction constant. (Author)

AD-258 928 Div. 25, 13
(6 July 61) OTS price $4.60

Fritz Engineering Lab., Lehigh U., Bethlehem, Pa.
THE POST-BUCKLING STRENGTH OF WIDE-FLANGE BEAMS,
by G. C. Lee and T. V. Galambos. Rept. on Welded Continuous Frames and Their Components. June 61, 39p. incl. illus. tables (Rept. no. 205E.12)
(Contract Nonr-61003)
Unclassified report

DESCRIPTORS: *Mechanics, Tests, Structures, Design, Hardening, Theory, Moments, Deformation, Deflection, Test methods, Mechanical properties, Plasticity, Flanges, *Failure (Mechanics), Buckling, Steel, *Beams.

A discussion is presented on a series of beam experiments which were performed to study the behavior of short, laterally braced wide-flange beams of as-rolled ASTM A-7 structural steel. Efforts were directed toward (1) the determination of the maximum permissible spacing of lateral supports for beams subjected to constant plastic moment, and (2) the study of the post-buckling strength and the cause of failure of relatively short beams. It was found that for beams with length/weak axis radius of gyration less than or equal to 45 failure is triggered by local buckling of the compression flange. All the beams showed considerable post-buckling strength and in each case a plastic hinge of sufficient rotation capacity was formed. Beams longer than 45 times the weak axis radius of gyration failed due to lateral buckling. (Author)

AD-258 951 Div. 25, 8, 14
(3 July 61) OTS price $5.60

Trans-Tech, Inc., Gaithersburg, Md.
IMPROVED FERROMAGNETIC BODIES FOR USE IN MICROWAVE DEVICES,
by H. H. Greger and A. C. Blankenship. Final rept. 1 Apr 59-31 Dec 60. 54p. incl. illus. tables.
(Contract DA 36-039-sc-78907)
Unclassified report

DESCRIPTORS: *Ferrites, *Ferromagnetic materials, *Microwave equipment, Nickel compounds, High temperature research, Crystal structure, Microwave frequency, Mathematical analysis, Measurement, Tests, Sintering, Porosity, Dielectric properties, Ceramic materials.

Pores are an inhibiting medium to the growth of crystallites in microwave ferrite during the early stages of sintering. Pore size and crystal size are interrelated and are dependent on sintering temperature, time, and various factors in the preparation of the ceramic body. In porous bodies the use of additives to limit and control grain growth to less than one micron is of limited value. However, pressures greater than 7000 psi and temperatures of about 1050 C produced densities in excess of 95% of theoretical in nickel ferrite while keeping grain size below 0.5 micron. The electronic measurements indicate that the grain size in a polycrystalline microwave ferrite is of fundamental significance in determining the high power linearity. Porosity is helpful only when the pores are small and homogeneously dispersed between small grains. Very nearly equal performance can be obtained when the porosity is removed, provided the grains

are kept sufficiently small. Improved high power performance of dense, fine grained ferrite of less than 0.5 micron particle size, may be achieved through the prevention of the exponential increase in absorption after the critical field has been exceeded, rather than by increasing the critical field value. An experiment with Mg-Mn ferrite indicated the principle applies also to spinel compositions other than Ni. (Author)

AD-258 953 Div. 25, 7, 17
(30 June 61) OTS price $2.60

David Sarnoff Research Center, Princeton, N. J.
THERMOELECTRIC MATERIALS FOR POWER CONVERSION,
by B. Abeles, G. D. Cody, and others. Quarterly progress rept. no. 7, 1 Aug-31 Oct 60. 15 Nov 60, 24p. incl. illus. tables, 15 refs.
(Contract NObs-77057)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Materials, *Semiconductors, *Electric power production, Intermetallic compounds, Alloys, Sulfides, Silicides, Rare earth compounds, Bonding, Thermal diffusion, Tellurides, Generators, Electrical properties, Thermal conductivity, Sandwich construction, Measurement.

Research was conducted on ternary compounds, metal silicides and rare-earth sulfides. High temperature thermal diffusivity measurements in InSb are reported as are measurements of the efficiency of a thermoelectric power generator. The material present as the minor phase in stoichiometric AgSbTe2 was identified as Ag2Te. The examination of the properties of metal silicides was extended to include metal trisilicides. Only a few metals are known to form trisilicides, and of these iridium trisilicide has been examined and found to be a p-type semiconductor. The preparation of the rare-earth sulfides Ce2S3 and Nd2S3 has been accomplished and electrically conducting phases obtained by decreasing the sulfur content of these materials below that present in the Ce2S3 phase. The thermal diffusivity of InSb was measured at temperatures up to 700 K and this has been used to obtain the temperature dependence of the thermal conductivity. The lattice thermal conductivity has been compared with theoretical predictions. Measurements on a thermoelectric power generator having a sandwich construction with two materials in each branch have shown an efficiency of at least 11%. (Author)

AD-258 965 Div. 25
(30 June 61) OTS price $5.60

Trieste U. (Italy).
ON THE ENERGY LOSS AND SPECIFIC IONIZATION OF A RELATIVISTIC PARTICLE IN A POLARIZABLE MEDIUM,
by P. Budini, L. Taffara, and C. Viola. Final rept. 31 Jan 61, 51p. incl. illus. table.
(Contract AF 61(052)211)
(AFOSR-567)
Unclassified report

DESCRIPTORS: *Quantum mechanics, *Relativity theory, Hydrogen, Helium, Cerenkov radiation, *Ionization, Energy, Absorption, Particles, Partial differential equations, Integral equations.

The dispersive and absorptive properties of a given medium are studied in order to deduce formulae to be used in the theory of energy loss suffered by a ionizing particle traversing the medium and of ionization produced by it in the medium. Specific energy loss is calculated for electrons and positrons in H and He at different pressure and at liquid state trying to put in evidence the different behaviour of the two particles. Primary specific ionization is studied and a theory is given for the calculation of ionization of the further generations. Summing the results, total specific ionization can be calculated. The results are applied to some particular cases and compared with experimental results. The problem of mixtures of elements is discussed. In this case a new effect is theoretically forseen which should be due to the reabsorption by one of the component of the mixture of Cerenkov radiation emitted by the other. This effect could give a pronounced enhancement of relativistic increase of primary specific ionization as it is shown in two particular cases. (Author)

AD-258 970 Div. 25, 4
(30 June 61) OTS price $9.60

University Coll., London (Gt. Brit.).
d-ORBITALS IN SOME CHEMICAL BONDS,
by D. P. Craig and C. Zauli. Final rept. 1 Jan-59-31 Dec 60. Jan 61, 110p. incl. illus. tables, 33 refs.
(Contract AF 61(052)61)
AFOSR-653)
Unclassified report

DESCRIPTORS: *Chemical bonds, *Atomic orbitals, Quantum mechanics, Electrostatics, Electrons, Atomic structure, Valence, Atomic energy levels, Mathematical analysis, Sulfur compounds, Fluorides, Fluorine, Carbon, Hydrogen, Chlorine.

It has been generally accepted that elements of the second row of the periodic table, such as S and P, expand the octet in certain of their compounds, and that 3d orbitals are used in the bonds. It has been suggested that the ligand field can produce a contraction of the 3d orbitals to a size compatible with the formation of strong spd hybrids, and the proposal was supported by calculations in which the ligands were represented by positive point charges. The problem of the perturbation of d orbitals by various ligand atoms was examined. Electrostatic potentials were calculated for H,C,F, and Cl atoms, and used in a calculation of the perturbing effect of the atoms on the 3d electrons. Optimum parameters have been found for the 3d electrons, and values found for the electrostatic terms in the total energy. The perturbing effect of C towards second row elements, as for example in -CH3, is unexpectedly strong, comparable to that of Cl. On the other hand H has a quite negligible effect. (Author)

AD-258 987 Div. 25, 7, 17
(5 July 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
THERMOELECTRIC POWER GENERATION AND RELATED PHENOMENA.
Bimonthly rept. no. 11, 7 Sep-7 Nov 60. 18 Jan 61, 18p. incl. illus. table.
(Contract NObs-77034)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Generators, Intermetallic compounds, Alloys, Gallium compounds, Arsenides, Aluminum compounds, Materials, Electrical properties, Resistance, Measurement, Temperature, Thermal diffusion, Thermal conductivity, *Semiconductors, High temperature research.

High-temperature electrical measurements were made on n-type GaAs-AlAs alloy specimens containing 3.8 and 7.8 mol-% AlAs. An initial decrease in resistivity was observed as the temperature was increased. The higher alloys exhibited Hall coefficient-reciprocal temperature relationships similar to those observed for n-type GaAs. Thermoelectric power data suggest that the thermoelectric power of the GaAs-AlAs alloys increases with AlAs concentration. Evaluation of the solute build-up technique indicated that quartz was not a suitable material for a melt container in the preparation of Ga compounds requiring long reaction times in view of the probable contamination of the melt by Si. The thermal diffusivity of GaAs was measured as a function of temperature, and the preparation of a GaAs-AlAs alloy sample for measurement was begun. The specific heat of GaAs was measured from 0 to 350 C and found to be 0.347 joule/g-deg C.

AD-258 988 Div. 25, 7, 17
(5 July 61) OTS price $3.60

Battelle Memorial Inst., Columbus, Ohio.
THERMOELECTRIC POWER GENERATION AND RELATED PHENOMENA.
Bimonthly rept. no. 12, 7 Nov 60-7 Jan 61.
24 Mar 61, 30p. incl. illus. table.
(Contract NObs-77034)

Unclassified report

DESCRIPTORS: *Thermoelectricity, Generators, Intermetallic compounds, Alloys, Gallium compounds, Arsenides, Aluminum compounds, Materials, Electrical properties, Resistance, Measurement, Temperature, *Semiconductors, Thermal diffusion, Thermal conductivity, High temperature research, Zone melting.

An alloy of 85 GaAs-15 AlAs was prepared by zone leveling at a slow crystallization rate, and an initial effort to prepare a GaSb-GaP alloy was undertaken. High-temperature electrical measurements were made on a GaAs-AlAs alloy and on a selected sample of GaSb. Theoretical work on the electronic properties of GaAs and GaAs-AlAs based on the assumption of secondary minima in the conduction band has been carried out and the predictions of theory compared with experimental results. Some difficulties have arisen in connection with the thermal-diffusivity measurements on GaAs-AlAs alloys and on germanium. Speculations on the origins of these difficulties and measures being taken to surmount them are given. (Author)

AD-258 997 Div. 25
(6 July 61) OTS price $1.10

Cornell U., Ithaca, N. Y.
PLASTIC BUCKLING OF CYLINDRICAL SHELLS FOR CASES OF NON-HOMOGENEOUS STRESS DISTRIBUTION,
by P. P. Bijlaard. Final rept. 1957, 7p. incl. table.
(Contract DA 30-115-ORD-718)

Unclassified report

DESCRIPTORS: *Cylindrical bodies, Structural shells, *Structures, Buckling, Failure (Mechanics, *Stresses, Plasticity, Deformation, Metal plates, Applied mathematics, Mathematical analysis, Theory.

An attempt was made to derive a simple design formula for computing the plastic reduction coefficient to be applied to the elastic buckling stress in the computation of plastic buckling stresses of cylindrical shells subjected to bending.

AD-259 009 Div. 25, 4, 20
(5 July 61) OTS price $10.10

Microwave Lab., Duke U., Durham, N. C.
REPORT NO. 32 TO PHYSICS DIVISION, AIR FORCE OFFICE OF SCIENTIFIC RESEARCH, JANUARY 1, 1961-MARCH 31, 1961.
31 Mar 61, 1v. incl. illus. tables, 120 refs.
(Contract AF 49(638)765)

Unclassified report

DESCRIPTORS: *Microwave spectroscopy, *Free radicals, Radiochemistry, Deuterium, *Amino acids, *Acetonitriles, Nuclear spins, Nuclear resonance.

This report includes:
ABSTRACTS- WASHINGTON MEETING- 1961. 1961, 8p.
(Technical rept. no. 1)

DEUTERIUM SUBSTITUTION IN AN ESR STUDY OF RADIATION-INDUCED FREE RADICALS, by Ichiro Miyagawa and Walter Gordy. 1961, 13p. incl. illus.
(AFOSR-1021)

THE MILLIMETER WAVE SPECTRUM OF METHYL CYANIDE AND THE LAMBDA TYPE DOUBLING, by Patcha Venkateswarlu, John G. Baker, and Walter Gordy. 1961, 11p. incl. illus. tables.
(AFOSR-1022)

TEMPERATURE EFFECTS ON THE FORMATION OF FREE RADICALS IN THE AMINO ACIDS, by Frank Patten and Walter Gordy. 1961, 19p. incl. illus.
(AFOSR-1023)

AD-259 038 Div. 25, 7, 17
(27 June 61) OTS price $1.60

Chrysler Corp., Detroit, Mich.
RESEARCH PROGRAM ON SEMICONDUCTING COMPOUNDS FOR THERMOELECTRIC POWER GENERATION AT HIGH TEMPERATURES,
by C. R. Lewis. Bi-monthly progress rept. no. 4, 15 Nov 60-14 Jan 61, 14 Jan 61, 9p. incl. illus.
(Contract NObs-78664)

Unclassified report

DESCRIPTORS: *Semiconductors, *Thermoelectricity, High temperature research, Materials, Refractory materials, Metals, Intermetallic compounds, Electrical properties, Resistance, Thermal conductivity, Measurement, *Electric power production.

Progress in the investigation of semiconducting compounds included the preparation of W, Ta, Hf, and Re compounds. Ta formed compounds with Se, Te, Ge, and Sb. Hf formed compounds with Se, Ge, and Sb. The material resulting from the reaction of Hf and Te gave no x-ray diffraction pattern. The Hf-Bi reaction product showed large acicular crystals on metallographic examination, but the

x-ray diffraction pattern of the material gave only lines due to Bi. Re formed compounds with Se, Te, and Ge. ReTe showed evidence of more than 1 phase. ReSe showed a very sharp inflection point in both resistivity and Seebeck coefficient at 70 C. A study is being made of the possibility of spurious effects caused by rectified voltages picked up from nearby radio and television stations.

AD-259 044 Div. 25, 17
(6 July 61) OTS price $1.60

Illinois Inst. of Tech., Chicago.
CHEMICAL THERMODYNAMICS OF MATERIALS AT HIGH TEMPERATURES,
by Russell K. Edwards and Phillip G. Wahlbeck.
Final rept. 30 June 61, 8p. incl. illus. tables.
(Contract AF 49(638)346)

Unclassified report

DESCRIPTORS: *Gallium, *Indium, *Liquid metals, *Phase studies, Test equipment, *Hydrogen, Hydrides, *Scandium, *Yttrium, Solids, Solubility, Solutions, *Metals, Pressure, Temperature, Atoms, Liquids, Mixtures, Spheres, Glass, Volume, Measurement, *Thermodynamics, Materials, High temperature research.

The activities of Ga and In are to be determined as a function of the composition of the 2-component system, Ga-In. An investigation of the Sc-H and Y-H systems is in progress. The present effort is aimed at the establishment of the thermodynamic properties of the systems and construction of the phase diagrams. For this purpose, equilibrium H pressure-temperature-composition data are obtained. The behaviors of the Sc-H and Y-H systems are similar, with the equilibrium pressures in the Sc-H system being higher than those of the Y-H system. Experimental work was completed on the volume of mixing of noninteracting spheres of various radius ratios. Glass beads, 126 to 222 microns in diameter were used.

26. PRODUCTION AND MANAGEMENT

AD-258 429 Div. 26, 14, 17
(22 June 61) OTS price $3.60

Anaconda Wire and Cable Co., Muskegon, Mich.
STANDARDIZATION OF MAGNET WIRE (TWO TYPES) FOR USE AT 500 C (932 F),
by Wesley W. Pendleton and John P. Fekete. Final rept. 1 Jan-31 Dec 60. 31 Dec 60, 1v. incl. tables.
(Contract NObs-78320)
Unclassified report

DESCRIPTORS: *Magnet coils, *Copper wire, Insulating materials, Electric insulation, Ceramic coatings, Enamel coatings, Metal coatings, Nickel plating, Glass textiles, Silicone resins, Pyrolysis, Sintering, Aging, Temperature, Specifications, Standardization, Electric wire, Manufacturing methods, Encapsulation, Ceramic fibers, Glass, Moistureproofing, High temperature research.

Firing techniques require that fine wire be fired in a vacuum in order that the wire conductor not be affected by oxidation. The firing cycle for larger sized wires is done in air with 5 to 30 min exposures at 500 and 675 C with breakdown strengths of 1000 v/mil. The initial physical properties of the enameled wire as well as the shelf aging problem can be improved to acceptable levels by proper choice of resin and a graduated reduction in glass content. Moisture-proofing of coils depends on the continuity of a treating glass applied after a coil has been fired. Both fiber-served and enameled wire have been made on a semi-production scale by semi-skilled personnel utilizing only standard methods and procedures. (Author)

AD-258 460 Div. 26, 17
(21 June 61) OTS price $11.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WEAR OF CUTTING TOOLS (SELECTED PARTS) (Iznos Rezhushchego Instrumenta),
by T. N. Loladze. 24 Feb 61, 156p. incl. illus. tables (Trans. no. MCL-428 from the book Wear of Cutting Tools, 355p., 1958)
Unclassified report

DESCRIPTORS: USSR, *Cutting tools, Life expectancy, Machining, Friction, Temperature, Metals, Steel, Phase transitions, Adhesion, Diffusion, Deformation, Plasticity, Crystal structure, Alloys, Materials.

Contents:
Wear of cutting tools
On the temperature in the contact layers
On the structural transformations in contact layers during metal cutting
On the theory of adhesion wear
Cutting steel with preheating at low speed
Cutting Ni and Ti with preheating at low speed
Wear of tool at high cutting speeds
On the value of the diffusion coefficient
On the dominating factor in the diffusion wear of tools
On the papers of V. Davil', N. F. Kazakov, and Ye. Trent
On the theory of chemical wear of powder metallurgy and hard alloys

AD-258 483 Div. 26, 14
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GRINDING OF CERAMIC MATERIALS WITH BOUND ABRASIVE (Shlifovka Keramicheskikh Materialov Svyazannym Abrazivom),
by T. P. Kapustina and A. A. Bykova. Jan 61, 8p. incl. illus. tables (Trans. no. MCL-774 of Steklo i Kermamiko 7:pp. 12-15, 1959)
Unclassified report

DESCRIPTORS: Grinding wheels, *Abrasives, *Ceramic materials, Abrasion, Materials, Disks, Design, Processing, *Machining, USSR.

AD-258 485 Div. 26, 14
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GRINDING CERAMIC MATERIALS WITH A FREE ABRASIVE (Shlifovka Keramicheskikh Materialov Svobodnym Abrazivom),
by T. P. Kapustina, Jan 61, 11p. incl. illus. tables (Trans. no. MCL-781 of Steklo i Keramika 6:pp. 18-21, 1960)
Unclassified report

DESCRIPTORS: USSR, *Ceramic materials, Grinders, *Abrasives, Hardness, Physical properties, Crystal structure, Surface properties, Corundum, Silicon compounds, Carbides, Boron compounds, Machines, Processing, Materials.

AD-258 637 Div. 26, 17
(28 June 61) OTS price $1.60

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC WELDING OF REFRACTORY METALS,
by C. R. Frownfelter. Bimonthly progress rept. no. 1, 1 Mar-30 Apr 61. 5 June 61, 12p. incl. illus. tables.
(Contract NOw 61-0410-c)
Unclassified report

DESCRIPTORS: *Refractory materials, *Welding, *Ultrasonics, Sheets, Molybdenum alloys, Niobium alloys, Titanium alloys, Tungsten, Brittle materials, Spot welds, Mechanical properties, Physical properties, Metals, Pressure, Spot welding.

An investigation was initiated to determine the ultrasonic welding machine settings required and to evaluate the properties of welds produced in Nb-10Mo-10Ti and Mo-0.5Ti alloys, and W. The physical and mechanical properties of these materials were tabulated. An empirical formula was used to estimate the minimum electrical energy required to weld each of these materials for welding intervals of 0.2, 0.3, and 0.5 sec. Two methods available for determining the proper clamping force include the weld nugget pullout test and the temperature rise in the weld zone. Preliminary measurements were made of the temperature rise in the weld zone by welding a thermocouple of a coupon of 0.011-in. Mo-0.5 Ti alloy and a no. 40-gage constantan wire with a power level of 1200w applied for 0.6 sec. The optimum clamping force was at or below the 300- to 400-lb. region, which was confirmed by the weld nugget peel test. A sonotrode tip of Astroloy (a Ni alloy) machined to a 3-in. radius was used.

AD-258 652 Div. 26, 8, 13
(27 June 61) OTS price $2.60

Eastern Air Devices, Inc., Dover, N. H.
DEVELOPMENT OF TWO HIGH TEMPERATURE BLOWER UNITS,
by S. A. Davis. Interim development rept. no. 7,
2 Sep-2 Dec 60, 2 Dec 60, 21p.
(Contract NObsr-77537)
Unclassified report

DESCRIPTORS: *Bearings, *Blowers, Tests, *Electronic equipment, Military requirements, Temperature, Cooling, Life expectancy, Design, *Cooling fans, Electric motors.

AD-258 726 Div. 26, 17, 30
(29 June 61) OTS price $3.60

Battelle Memorial Inst., Columbus, Ohio.
STUDIES, INVESTIGATIONS, AND TESTS OF STANDARD AND NONSTANDARD PARTS AND MATERIALS. TASK 605. EVALUATION OF FLUXES IN FLUX-CORED SOLDERS,
by A. F. Haskins and R. M. Evans. Final rept.
31 Jan 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-85294)
Unclassified report

DESCRIPTORS: *Soldering fluxes, Test methods, Sampling, Specifications, Corrosion, Additives, Detection.

To establish the necessity of including flux from cored solders in qualification inspections, activated and nonactivated liquid external fluxes and cored solders containing fluxes of the same composition were studied. An effective method for removing flux from the cored solder, the condensation-extraction method, proved effective. Flux extracts from cored solders and equivalent liquid external fluxes were subjected to test methods of the Materials and Performance categories in Spec MIL-F-14256b. Evaluation of the results showed that flux extracts performed in the same manner as the liquid external flux in all but 3 test methods: (1) acid number; (2) dryness; and (3) resistivity of water extract. A substitute for the complicated vacuum-deposited-copper corrosion test using electroplated Cu on ferrotype panels was found. Methods for detecting the presence of the flux additives, metallic salts and maleic anhydride, were established.

AD-258 810 Div. 26, 17
(29 June 61) OTS price $21.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING OF CHROME-NICKEL AUSTENITE STEELS,
by B. I. Medovar. 29 Mar 61, 1v. incl. illus. tables (Trans. no. MCL-458, pt. 2, pp. 421-807).
Unclassified report

DESCRIPTORS: *Stainless steel, USSR, *Welding, Welded joints, *Steel, Austenite, Nickel alloys, Chromium alloys, Corrosion research, Corrosion, Welding fluxes, Welding rods, Arc welds, Heat treatment, Mechanical properties, Corrosion resistant alloys, Hardening Microstructure, Arc welding.

CR-NI AUSTENITIC STEEL WELDS: Porosity; Corrosion resistance; Theory of intergranular corrosion; The effect of primary ferrite on corrosion resistance; The effect of alloying admixtures, welding, heat treatment conditions, and strain hardening on intergranular corrosion resistance; Knife-line corrosion in welded joints; Resistance of welded joints to over-all corrosion (Oxidizing and Non-oxidizing liquids); Transcrystallitic corrosion in weld joints; and Resistance to intergranular and over-all gas corrosion. MECHANICAL PROPERTIES OF WELDED JOINTS: Effect of alloying, microstructure, and test temperatures; Effect of heat treatment; and Effect of cold hardening. TECHNOLOGICAL WELDING PROBLEMS: Basic peculiarities; Prevention of hot cracks; Fluxes and electrodes for automatic welding; Flux welding; Flux welding in the production of equipment; Electro-slag welding; and Gas-shielded arc welding.

AD-258 812 Div. 26, 17
(29 June 61) OTS price $11.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WELDING (COLLECTION OF ARTICLES).
21 Mar 61, 149p. incl. illus. tables 14 refs.
(Trans. no. MCL-496 of Svarka - Sbornik Stately: pp. 3-15, 166-193, 201-214, 1958)
Unclassified report

DESCRIPTORS: USSR, *Welding, *Welds, Crystal structure, Crystallization, Vibration, Mechanical properties, Aluminum alloys, Steel, *Electrodes, Shielding, Argon, Automation, Ultrasonics, Magnesium alloys, Titanium alloys, Coatings, Slags, Salts, Chlorides, Fluorides, Arc welding, Temperature, Electric current, Welding fluxes.

Contents:
Investigation of the effect of elastic vibrations of varying frequencies on the crystallization of the weld pool
Investigation of the welding properties of some titanium alloys
48-AE-1 electrodes for manual welding of aluminum-magnesium alloys
Investigation of current flow through a slag pool in the electro-slag process
Technology and equipment for electro-slag welding and surfacing of extensive seams

AD-258 817 Div. 26, 17
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PRECISION OF PARTS MADE IN METALLIC MOLDS (Tochnost' Detali Izgotovlyaemykh V Metallicheskikh Formakh)
by Ye. G. Kopanevich. 20 Mar 61, 30p. incl. illus. tables (Trans. no. MCL-613 of Gosudarstvennoye Nauchnotekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moscow: pp. 179-198, 1958)
Unclassified report

DESCRIPTORS: USSR, *Powder metallurgy, Precision finishing, Molding, *Dies, Design, Sintering, Machine shop practices, Metal forming presses, Processing, Statistical analysis, Quality control, Production, Mathematical analysis.

AD-258 855 Div. 26, 17, 31
(30 June 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF PROCEDURES FOR WELDING 2-INCH-THICK TITANIUM-ALLOY PLATE,
by R. L. Koppenhofer, W. J. Lewis and others.
Bimonthly rept. 30 Apr 61, 16p. incl. illus. tables.
(Contract NOw-60-0390-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Metal plates, *Welding, Welds, Welded joints, *Arc welding, Ship plates, Submarine hulls, Mechanical properties, Manufacturing methods, Shielding, Argon, Aluminum alloys, Vanadium alloys, Arc welds, Microstructure, Hardness, Chemical properties, Tensile properties.

Low-heat-input welds were made in the Ti-6Al-4V and Ti-5Al-2.5Sn alloy base plate with filler wire that matched the composition of the base plate. Impact and tensile properties were about the same as those obtained in similar welds made with a high heat input. Notch toughness was at least equal to or greater than that of the base plate. In welds made by depositing Ti-6Al-4V filler wire in Ti-5Al-2.5Sn base plate, the tensile properties were about equal to those of the base plate, and the impact properties were very low. The use of A-55 filler wire in Ti-5Al-2.5Sn base plate resulted in impact properties considerably better than those of the base plate. The strength of this weld metal was low. Ti-6Al-4V filler wire deposited in A-70 base plate resulted in impact properties higher than those of the base plate. A yield strength of 120,000 psi and an elongation of 8.5% were obtained. A weld made by manually depositing a high-purity Ti-6Al filler wire in Ti-6Al-4V base plate had the best impact properties obtained to date. (Author)

AD-258 856 Div. 26, 17, 31
(30 June 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF PROCEDURES FOR WELDING 2-INCH-THICK TITANIUM-ALLOY PLATE.
by R. L. Koppenhofer, W. J. Lewis and others.
Bimonthly rept. 28 Feb 61, 18p. incl. illus. tables.
(Contract NOw-60-0390-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Metal plates, *Welding, Welds, Welded joints, *Arc welding, Arc welds, Ship plates, Submarine hulls, Mechanical properties, Manufacturing methods, Shielding, Argon, Aluminum alloys, Vanadium alloys, Tensile properties, Chemical properties, Hardness, Microstructure.

Weld cracking tests were made and the properties of welds in 2-in.-thick A-70 base plate were obtained for welds made with A-55 filler wire. The impact properties for the weld made in A-70 base plate were about 5 ft-lb higher than those of the base metal, and the weld-metal yield strength was about 11,000 psi lower than that of the base plate. In the weld made in Ti-6Al-4V plate with Ti-5Al-2.5Sn filler wire, the notch toughness and yield strength were similar to those of welds made with Ti-6Al-4V filler wire; however, the ductility of the weld made with the Ti-5Al-2.5Sn filler wire was considerably higher. In the weld made in Ti-6Al-4V with A-55 filler wire, the notch toughness was better than that of the weld made with matching filler wire. However, the strength of the weld made with A-55 filler wire was low and transverse tension specimens failed in the weld metal at a joint efficiency of only 75%. (Author)

AD-258 893 Div. 26
(3 July 61) OTS price $1.60

Coast Guard, Washington, D. C.
TESTS OF PARKER RING SEAL FOR BUOY POCKETS.
26 June 61, 10p. incl. illus. (Rept. no. 242)
(Proj. CGTD J24-2/1-2-6(c))
Unclassified report

DESCRIPTORS: *Seals, *Gaskets, *Rubber gaskets, *Rubber seals, Aluminum, *Buoys, Rings, Tests, *Metal seals, Design.

Tests were conducted to determine the suitability of a Parker Ring Seal for use as a closure gasket in buoy pockets. The gasket assembly consists of an aluminum flat ring having a 24-inch I. D. and 30-1/2-inch O. D. with a neoprene rubber ring insert. The ring seal was installed in a mock-up buoy pocket and air tested to one atmosphere. Fire hose and water submergence tests were also performed. It was concluded that the Parker Ring Seal gasket was adequate for use in Coast Guard buoy pockets. (Author)

AD-258 905 Div. 26, 8, 30
(3 July 61) OTS price $11.50

General Electric Co., Owensboro, Ky.
AIR FORCE INLINE EXHAUST MACHINE. PART I.
by A. D. Sanders. Final project engineering rept. pt. 1, June 57-Nov 60. 8 May 61, 1v. incl. illus. tables.
(Contract AF 33(600)26222)
Unclassified report

DESCRIPTORS: Design, Tests, *Electron tubes, Vacuum apparatus, *Vacuum systems, Air force equipment, Seals, *Machines.

The design, development, and application of the receiving tube inline exhaust machine is described under the following major groups: (1) a general description of the equipment and an operating instruction book; (2) a report on preliminary design work and development of the vacuum equipment and a prototype machine; (3) a report on system performance evaluation tests performed during five consecutive days of operation; and (4) a detailed description of process experiments performed on both the prototype equipment and the machine, together with life test results, for receiving tube type 5654. (Author)

AD-258 906 Div. 26, 8, 30
(3 July 61) OTS price $8.10

General Electric Co., Owensboro, Ky.
AIR FORCE INLINE EXHAUST MACHINE. PART II,
by A. D. Sanders. Final project engineering rept. pt. 2. May 61, 1v. incl. illus. tables.
(Contract AF 33(600)26222)
(ASD TR 61-7-352)
Unclassified report

DESCRIPTORS: Design, Tests, *Electron tubes, Vacuum apparatus, *Vacuum systems, Air force equipment, Gas leaks, Reliability, Seals, *Machines.

Modifications in the Receiving Tube Inline Exhaust Machine are described. Changes were made in the pre-heat and tip-off unit, the leak detection system, the induction heaters, and the ovens, to obtain significant improvements in the performance of the machine. Life test experiments on the 6005 indicated that the outgassing characteristics of this tube impose a basic limitation of the residual gas level that may be attained by any practical process schedule. The degree of outgassing attainable within the present operating limits of the machine is controlled primarily by the complex desorption characteristics of the tube structure acting in combination with pumping restrictions due to the tubulation and micas. Variations in process parameter levels over a broad range seemed to have very little effect on the total amount of gas evolved. The life tests on the 6005 tubes indicated some

improvement due to the Inline Exhaust process, but the results were not as encouraging as had been expected. Also a description of process experiments and life tests on subminiature tube Type 5902 is included. (Author)

AD-258 948 Div. 26
(30 June 61) OTS price $6.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
INFORMATION MANAGEMENT IN THE WEAPONS SYSTEMS DEVELOPMENT PLAN,
by G. M. Bedford. Interim rept. on Project Summit. 15 Mar 61, 56p. incl. illus. table.
(Contract DA 18-064-cml-2733)
Unclassified report

DESCRIPTORS: *Management engineering, Weapons, *Programming, *Research program administration, Operations research.

Contents:
The information economy in the weapons systems development plan
A systems logic for the economy
Adjustments required in the supply to meet the demand

AD-258 975 Div. 26, 17, 31
(30 June 61) OTS price $1.10

Titanium Metals Corp. of America, Toronto, Ohio.
THE PRODUCTION AND WELDING OF HEAVY Ti-13V-11Cr-3Al TITANIUM ALLOY PLATE,
by D. R. Mitchell. Bimonthly rept. no. 6, 1 Feb-31 Mar 61. 28 Apr 61, 3p. incl. table.
(Contract NOa(s) 60-6092-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, *Metal plates, Ship plates, *Production, Processing, *Welding.

The production of plate for Items 1 and 2 of the subject contract was completed. Item 1, 40 units of 2-x 8-x 30-in. Ti-13V-11Cr-3Al plate, is scheduled to be shipped. The plates for Item 2, the evaluation of some of the welding characteristics of 2-in.-thick Ti-13V-11Cr-3Al were received. Joint preparation has started on the first set of plates. A limited amount of welding has been performed on 1-in.-thick Ti-13V-11Cr-3Al plate to develop set-up procedures. (Author)

AD-258 977 Div. 26, 9, 25, 31
(5 July 61) OTS price $9.60

Armour Research Foundation, Chicago, Ill.
METHODS FOR DYNAMICALLY BALANCING NAVAL MACHINERY IN PLACE,
by E. H. Fey. Final rept., Pt. 1. Aug 58 rev. July 59. July 59, 1v. incl. illus. table (Supersedes AD-212 548L)
(Contract NObs-72241)
Unclassified report

DESCRIPTORS: *Machines, *Naval equipment, Test methods, *Vibration, Theory, Analysis, Mathematical analysis, *Damping, Vibration mechanisms, Shipborne.

The methods and equipment available for balancing machinery in place were reviewed for the purpose of obtaining an improved and more economical method of maintaining quiet shipboard machinery. The study was limited to the consideration of rotating equipment with rigid rotors. An electrical balancing method, used for shop balancing, was found to be suitable for in-place balancing. Recommended modifications for this equipment include the addition of four electrical networks for plane separation and compensation and the addition of a reference signal generator. None of the available balancing equipments can satisfactorily detect vibrations due to unbalance in the presence of severe background vibrations which have frequencies within 2 cps of the rotor frequency. The general effect of background vibration is to cause fluctuations in the vibration amplitude and phase angle indicators of balancing equipments. (Author)

AD-259 004 Div. 26, 15
(5 July 61) OTS price $1.60

Case Inst. of Tech., Cleveland, Ohio.
ASYMPTOTIC RELATIVE EFFICIENCY OF MOOD'S AND MASSEY'S TWO SAMPLE TESTS AGAINST SOME PARAMETRIC ALTERNATIVES,
by I. M. Chakravarti, F. C. Leone, and J. D. Alanen. May 61, 19p. incl. tables (Case Statistical Lab. Pub. no. 1046)
(Contract AF 49(638)361)
(AFOSR-846)
Unclassified report

DESCRIPTORS: *Analysis of variance, Statistical distributions, *Sampling, *Statistical tests, Statistical functions, Distribution theory, *Industrial research.

The asymptotic relative efficiency of Mood's test against the likelihood ratio test for the change in location of exponential distribution, is derived. Further, this is carried out for all three alternatives for Massey's test. The asymptotic powers are compared with the exact powers to find out how large a sample size is needed before one could use the expressions for the asymptotic power. (Author)

AD-259 005 Div. 26, 15
(5 July 61) OTS price $1.60

Case Inst. of Tech., Cleveland, Ohio.
THE FOLDED NORMAL DISTRIBUTION, III. ACCURACY OF ESTIMATION BY MAXIMUM LIKELIHOOD,
by N. L. Johnson. Apr 61, 14p. incl. illus. tables (Case Statistical Lab. pub. no. 1044)
(Contract AF 49(638)361)
(AFOSR-849)
Unclassified report

DESCRIPTORS: Probability, Statistical functions, *Statistical distributions, *Analysis of variance, Integral equations, Series, Distribution theory, *Industrial research.

Formulae for the asymptotic variances and covariance of the maximum likelihood estimators of the parameters of the folded normal distribution are obtained. Numerical comparisons with the asymptotic variances of moments estimators are made. (Author)

Division 27 - PROPULSION SYSTEMS

27. PROPULSION SYSTEMS

AD-258 355 Div. 27, 12, 17, 26
(26 June 61) OTS price $2.60

Mellon Institute, Pittsburgh, Pa.
THE EVOLUTION OF ULTRA-HIGH STRENGTH STEELS, AND RESEARCH ON MATERIALS AND VARIOUS NOVEL TECHNIQUES OF FABRICATION OF HIGH PERFORMANCE ROCKET MOTOR CASES.
Progress rept. no. 37, 1-31 May 61, 31 May 61, 19p. incl. illus.
(Contract NOrd-18169)

Unclassified report

DESCRIPTORS: *Steel, *Rocket motors, Arc welding, *Rocket cases, Materials, Melting, Aluminum wire, Processing, Beryllium, Wire, Casting, Manufacturing methods, Ultrasonics, Drawing (Machine processing), Welded joints, Tests, Welding, Tensile properties, Welds, Hydrostatic pressure, Mechanical properties, Filament wound construction.

Fine wires (0.005 in. diam) were drawn of 3 Al alloys, and effort was directed toward the production of Be wire. Study was continued of steel melting and casting techniques. Mechanical property tests of butt welds indicated that the addition of W facilitates the weldability of high tensile strength (300 ksi) steels. Studies are continuing on weld grain refinement with ultrasonic excitation. Filler wire evaluation was discontinued. Scale-model 3.5-in.-diam chambers heat treated to several strength levels were hydrotested. Rocoloy 270 showed considerable yielding (biaxial ductility) prior to fracture.

AD-258 431 Div. 27, 17
(23 June 61) OTS price $11.50

Westinghouse Electric Corp., Blairsville, Pa.
MANUFACTURING DEVELOPMENT OF TUNGSTEN ALLOYS FOR ROCKET NOZZLES. TECHNIQUE III. VACUUM ARC SKULL CASTING,
by A. E. La Marche. Final rept. 1 Jan 60-30 Apr 61, on Phase 2 on Manufacturing Process Development of Tungsten and Tungsten Alloys for Rocket Nozzles. 10 June 61, 1v. incl. illus. tables, 10 refs. (Rept. no. 2-CPFF-WG-78256-1-I-(5))
(Contract NOrd-18791)

Unclassified report

DESCRIPTORS: *Rocket motor nozzles, *Tungsten alloys, Tungsten, Casting, Molybdenum alloys, Melting, Powder metallurgy, Electric arcs, Vacuum furnaces, Production, Purification, Hardness, Grains (Metallurgy), Processing, Molding materials, Graphite, Manufacturing methods.

The vacuum arc skull casting technique was evaluated as a method of producing W and W alloys for rocket nozzles. Bars of the 50 W- 50 Mo, 70 W-30 Mo, 90 W-10 Mo wt-% alloys and pure W in the pressed and sintered condition were vacuum arc melted and skull cast into graphite molds in a vacuum melting facility. Destructive testing of resultant parts was conducted to determine the hardness, soundness, contamination and grain size of the castings. The first pure W skull castings ever produced were made. The ability to vacuum arc melt and cast 60- to 70- lb pure W castings was established. The vacuum arc skull casting of W-Mo alloy rocket nozzles in thin configurations may be achieved. The temperature of the W arc was calculated theoretically and confirmed in experimental melting to be in the order of 8,000 to 11,000 F. (Author)

AD-258 470 Div. 27, 1, 9
(21 June 61) OTS price $42.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF JET ENGINES (THEIR CYCLES AND CHARACTERISTICS),
by B. S. Stechkin, P. K. Kazandzhan and others. 27 Mar 61, 1v. incl. illus. (Trans. no. FTS-9953, pt. 3, pp. 615-851)

Unclassified report

DESCRIPTORS: *Ramjet engines, *Turbojet engines, *Turbopropeller jet engines, Mathematical analysis, Thrust, Acceleration, Deceleration, Ignition, Gas flow, Fuel consumption, Theory, Textbooks, USSR.

Contents:
Nonsteady-state performance of the turbojet engine
Two-shaft turbojet engines
Cycle and basic parameters of turbojet engines
Characteristics of turbojet engines
By-pass turbojet engines
Continuous-flow ramjet engines (continued in AD-258 493)

AD-258 491 Div. 27, 1, 9
(21 June 61) OTS price $19.75

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF JET ENGINES (THEIR CYCLES AND CHARACTERISTICS) (Teoriya Reaktivnykh Ovigateley),
by B. S. Stechkin, P. K. Kazandzhan and others. 27 Mar 61, 307p. incl. illus. (Trans. no. FTS-9953, pt. 1 from Gosudarstvennaye Izdatel'stov Oboronnoy Promyshlennosti, Moscow, pp. 1-533, 1958)

Unclassified report

DESCRIPTORS: Aerodynamics, *Jet engines, *Turbojet engines, *Rocket motors, *Ramjet engines, Theory, Textbooks, USSR, Mathematical analysis, Thrust, Drag, Jet engine inlets, Gas flow, Exhaust nozzles, Adiabatic gas flow, Compression shock, Combustion, Combustion chambers, Afterburners.

Contents:
The propulsive thrust of jet engines
Inlet diffusers
Exhaust nozzles
Jet engine combustion chambers
The turbojet-engine cycle (continued in AD-258 492)

AD-258 492 Div. 27, 9
(21 June 61) OTS price $27.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF JET ENGINES (THEIR CYCLES AND CHARACTERISTICS),
by B. S. Stechkin, P. K. Kazandzhan and others. 27 Mar 61, 1v. incl. illus. (Trans. no. F-TS-9953, pt. 2, pp. 308-614)

Unclassified report

DESCRIPTORS: *Aerodynamics, *Turbojet engines, Textbooks, USSR, Mathematical analysis, Thrust, Fuel consumption, Theory, Afterburners, Velocity, Gas flow, Tests.

Contents:
The turbojet engine cycle (continued from AD-258 491)
Preliminary gasdynamic rating and selection of

parameters for a turbojet engine
The characteristics of turbojet engines
Methods of experimental determination of turbojet engine characteristics
Method for calculating turbojet engine characteristics

AD-258 493 Div. 27, 1, 9
(21 June 61) OTS price $52.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF JET ENGINES (THEIR CYCLES AND CHARACTERISTICS),
by B. S. Stechkin, P. K. Kazandzhan and others. 27 Mar 61, 1v. incl. illus. tables (Trans. no. F-TS-9953, pt. 4, pp. 852-1142)
Unclassified report

DESCRIPTORS: *Ramjet engines, *Rocket motors, *Nuclear propulsion, Theory, Textbooks, USSR, Thrust, Fuel consumption, Fuel injection, Liquid rocket propellants, Combustion chambers, Aerodynamics, Cooling.

Contents:
Continuous-flow ramjet engines (continued from AD-258 470)
Liquid-fuel rocket engines
Concerning the use of atomic energy for jet engines

AD-258 520 Div. 27, 22
(27 June 61) OTS price $3.60

Free U. of Brussels (Belgium).
OPTIMUM DESIGN OF SOLID PROPELLANT ROCKETS,
by Jean A. Vandenkerckhove. 1960, 1v. incl. illus. tables.
(Contract AF 61(052)58-13; In cooperation with Poudreries Reunies de Belgique)
Unclassified report

DESCRIPTORS: Design, *Solid rocket propellants, *Rockets, Velocity, *Rocket motors, Propellants, Thrust, Combustion, Acceleration, Equations, Propellant grains, Pressure, Mathematical analysis, Guided missiles, *Combustion chambers, Density, Projectiles, Rocket motor nozzles, Exhaust nozzles, *Booster rockets.

A method is proposed whereby one can study rapidly the weight and size variations of a rocket motor that has to conform to given specifications in the full range of usable geometries and pressures. The method is general and independent of the shape of the propulsive charge, although it takes into account the ballistic properties of the propellant. Thus, from the preliminary design stage, the characteristics of the optimum motor can be determined. Also it is possible, when necessary, to make an estimate of how far one departs from the optimum to satisfy an extra condition. Finally it stresses the advantage that seems to exist in using several motors instead of a single unit in the case of large thrusts and short burning times. The acceleration of a rocket up to a given speed is also studied and relations have been established giving the maximum velocity obtainable when the outer diameter of the motor is imposed. Finally the importance of the dead weight is underlined.

AD-258 653 Div. 27, 12, 14
(28 June 61) OTS price $1.60

General Electric Co., Cincinnati, Ohio.
FABRICATION OF PYROLYTIC GRAPHITE ROCKET NOZZLE COMPONENTS,
by D. J. Shipp. Monthly progress rept. for Apr 61. 10 May 61, 12p. incl. illus. (Rept. no. DM 61-142; RNM 61-11)
(Contract NOw 61-0161-c)
Unclassified report

DESCRIPTORS: Rocket motors, *Rocket motor nozzles, Guided missiles, Pyrolysis, Surface to surface, Graphite, Coatings, Refractory materials, Refractory coatings, Processing, Manufacturing methods.

Furnace assembly design and graphite deposition parameters necessary to produce sub-scale test nozzle inserts were determined. One sub-scale insert of 0.075-in. pyrolytic graphite and a second stage Polaris A3 insert of semi-egg style design were delivered. Difficulty was experienced with the free standing liners. Compression molding of phenolic bonded graphite powder around pyrolytic graphite liners was unsuccessful. This system was replaced with phosphate bonded magnesia and castable graphite. Distortion of the pre-charred asbestos reinforced phenolic resin backup system for the free-standing semi-egg style insert which could cause failure at light-off. A redesign was made of the backup systems to provide complete support of the liner. Bonding of the flame shields to the inserts with C-6 cement was destroyed when the assembly was heated to the carbonization temperature of the cement by the differential thermal expansion between commercial and pyrolytic graphite.

AD-258 654 Div. 27, 17, 26
(28 June 61) OTS price $8.60

General Electric Co., Cincinnati, Ohio.
DEVELOPMENT OF ARC SPRAYING PROCESSES AND MATERIALS FOR SOLID ROCKET NOZZLES,
by B. E. Kramer. Final rept. on Development of High Strength Materials for Solid Rocket Motors. 1 Mar 61, 92p. incl. illus. tables (Rept. no. R61FPD156)
(Contract NOrd-18119)
Unclassified report

DESCRIPTORS: Rocket motors, *Rocket motor nozzles, Solid rocket propellants, Manufacturing methods, Tungsten, Refractory coatings, Refractory materials, *Flame spraying, Electric arcs, Plasma jets, Processing, Materials.

Equipment for arc metallizing W was operated with an Ar-stabilized arc and W wire as a consumable electrode for spraying W onto a removable mandrel. A larger, more efficient arc gun was developed and in addition, a commercial plasma jet spray gun was obtained and evaluated. The powder plasma-jet-sprayed W performed better than wire sprayed W, but neither spray process gave satisfactory results in rocket firings. A number of avenues of investigation were pursued in an attempt to upgrade the material and produce lighter weight structures. The state of development of arc or plasma sprayed W provides a product which is resistant to the erosive effects of high temperature aluminized solid propellents at moderate pressures, and which is functionally competitive with pressed and sintered W powders. For use at high chamber pressures, sprayed W is inadequate. (Author)

Division 27 - PROPULSION SYSTEMS

AD-258 680 Div. 27
(5 July 61) OTS price $ .75

National Aeronautics and Space Administration, Washington, D. C.
TRANSIENT TEMPERATURE PROFILES AND CALCULATED THERMAL STRAINS OF TURBOJET-ENGINE BUCKETS,
by J. R. Johnston, J. C. Freche, and R. A. Signorelli. June 61, 23p. incl. illus. (NASA Technical note D-848)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical Note D-848.

DESCRIPTORS: *Turbine blades, *Gas turbine blades, Turbojet engines, Thermal stresses, Deformation, Temperature, Heat transfer, Thermal diffusion, Tests.

Tests were conducted to measure the chordwise temperature profiles in the buckets of two turbojet engines (J47 and J33) subjected to starts, accelerations, decelerations, and shutdowns. The temperature measurements were used in conjunction with analytical procedures based on elastic strain concepts and simple beam theory to calculate thermal strains in the bucket airfoils. The results indicated that the most severe temperature gradients and the highest computed thermal strains occurred at the bucket leading edge during engine starts for both engines. (Author)

AD-258 759 Div. 27, 22
(29 June 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL STUDY OF EFFECTS OF GEOMETRIC VARIABLES ON PERFORMANCE OF CONICAL ROCKET-ENGINE EXHAUST NOZZLES,
by Harry E. Bloomer, Rober J. Antl, and Paul E. Renas. June 61, 61p. incl. illus. tables, 13 refs. (NASA Technical note D-846)

Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-846.

DESCRIPTORS: *Exhaust nozzles, *Rocket motor nozzles, *Conical nozzles, Tests, Test equipment, Test methods, Instrumentation, Pressure, Combustion chambers, Liquid rocket propellants, *Gas flow, Separation, Shock, Thrust, Combustion chamber gases.

An investigation was conducted to determine the performance and flow separation characteristics of a family of conical rocket exhaust nozzles. The nozzles were mounted on a water-cooled JP-4 gaseous-oxygen thrust chamber with a 2.67-inch-diameter throat. The range of nozzle variables included divergent half-angles from 15 to 30 degrees nozzle area ratios from 8/1 to 75/1, and pressure ratios from 35 to 840. The results of the investigation showed that, for nozzles of equal length, the 20 or 25 degrees half-angles were superior at vacuum conditions. The advantage of these over the smaller area ratio, 15 degrees half-angle nozzles amounted to about 1% in thrust coefficient. Nozzle separation characteristics were generalized by the use of the Mach number ratio across the oblique shock wave which occurs at the separation point. (Author)

AD-258 804 Div. 27, 1
(29 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE NORD AVIATION GRIFFON AND THE FUTURE OF THE TURBO-RAMJET ENGINE FOR POWERING SUPERSONIC AIRCRAFT,
by N. Daum. 31 Jan 61, 32p. incl. illus. table. (Trans. no. MCL-277 of Luftfahrttechnik 5:159-167, 15 May 59)

Unclassified report

DESCRIPTORS: *Ramjet engines, *Turbo ramjets, *Supersonic planes, Mach number, Thrust, Thermodynamics, Design.

The Nord Aviation has favored the development of a combination turbojet-ramjet power plant because it promises some advantages for aircraft at cruising speeds between Mach 2 and 4. In order to establish these advantages the behavior of a turbojet engine at increasing Mach number will, first of all, be discussed in detail, in connection with which the air-inlet effect problem will be investigated more closely. The behavior of the ramjet is considerably easier to describe. As against this, the characteristics of the turbo-ramjet compound engine are more thoroughly treated; the most important characteristic of this design was singled out to be its favorable weight. The specific features and characteristics of the compound engine developed for the Griffon are dealt with in a special chapter. (Author)

AD-258 813 Div. 27
(29 June 61) OTS $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE CONTROL OF GAS TURBINE AND RAM JET ENGINES (Pegulipovanie Gazoturbinnykh I Pryamotochnykh Vozdushno-Reaktivnykh Dvigateley)
by L. A. Zalmanzon and B. A. Cherkasov. 20 Mar 61, 41p. incl. illus. (Trans. no. MCL-501 of Gosudarstvennoye Izdatel'stvo Oboronnoye Promyshlennosti, Moscow: pp. 276-287, 297-301, 335-339, 1956)

Unclassified report

DESCRIPTORS: Orifices, Duct inlets, Control systems, Ramjet engines, *Gas turbines, *Fuel systems, *Turbojet engines, Cavitation, Nozzles, Flowmeters, Jet pumps, Atomization, Vaporization, Fuel sprays, Viscosity, Fuel nozzles, Fuel injection.

AD-258 862 Div. 27, 10, 14
(30 June 61) OTS price $.75

Defense Metals Information Center, Columbus, Ohio.
GLASS FIBER FOR SOLID-PROPELLANT ROCKET-MOTOR CASES,
by R. J. Runck and B. W. King. 6 June 61, 23p. incl. illus. tables, 15 refs. (DMIC memo. no. 110)

Unclassified report

DESCRIPTORS: *Rocket cases, *Glass textiles, Fibers, *Ceramic fibers, Threads, Glass, *Laminated glass, Epoxy resins, Plastics, *Laminates, *Filament wound construction, Reinforcing materials, Additives, Beryllium compounds, Oxides, Elasticity, Mechanical properties, Bonding, Refractory materials, Manufacturing methods, Production, Materials, Rocket motors.

Present rocket motor cases are being made with Type E commercial glass fibers because of the relative ease of manufacture, high resistance to weathering, strength and low cost. Processing improvements are considered the best immediate means to physical improvements. Some

improvement in the modulus of elasticity of Type E glass is possible by modified and improved manufacturing processes, but this may be accompanied by a loss in strength. Significant improvement in the modulus will create new problems in the glass bonding with plastics. The most effective additive for improving the glass modulus is BeO. Continuous filament glass fiber of this type is available, but expensive and difficult to manufacture. While increased modulus of elasticity is needed in fiber glass, only a fraction of this increase can be realized in the bulk modulus of the structures made from the fibers.

AD-258 952 Div. 27, 10
(15 June 61) OTS price $1.60

Rohm and Haas Co., Huntsville, Ala.
ENGINEERING RESEARCH,
by Charles H. Parr. Quarterly progress rept. 15 Dec 60-15 Mar 61. 15 June 61, 12p. incl. illus. (Rept. no. P-61-5)
(Contract DA 01-021-ORD-5135)
Unclassified report

DESCRIPTORS: *Rocket motors, Acceleration, *Solid rocket propellants, *Propellant grains, Stresses, Elasticity, Materials, Viscosity, Centrifuges, Mathematical analysis, Creep, Bonding.

The feasibility of testing small rocket motors on a centrifuge to investigate acceleration effects on solid propellant grains of large rocket motors was considered. The existence of a correspondence principle between linear dimension, acceleration, and time to produce a given distribution of stress or strain was investigated. For an elastic solid a simple correspondence exists between acceleration and linear dimension, the elastic problem being time independent if transitory starting effects are neglected. For a particular viscoelastic material, the correspondence between acceleration and linear dimension is the same as for the elastic solid but there is no correspondence between time and either linear dimension or acceleration. It was concluded that the straightforward use of the centrifuge test for studying long term effects of solid propellants has significant limitations. (Author)

AD-259 022 Div. 27, 17, 26
(6 July 61) OTS price $21.00

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J.
SHEAR SPINNING PROCESS DEVELOPMENT,
by A. L. Kitchin. Final technical engineering rept., vol. 1, 11 Aug 58-20 Oct 60. May 61, 45p. incl. illus. tables.
(Contract AF 33(600)37144)
(AMC TR 61-7-664, vol. 1) Unclassified report

DESCRIPTORS: Cylindrical bodies, Conical bodies, *Machining, Hydroforming, Lathes, Machine tools, *Processing, *Metals, Aluminum alloys, Nickel alloys, Chromium alloys, Titanium alloys, *Rocket cases, Manufacturing methods, Heat resistant alloys, Vanadium alloys, Steel, Stainless steel, Alloys, Deformation, Plasticity, Plastic flow.

Efforts were directed toward establishing a knowledge of the fundamental aspects of the shear spinning process. The work entailed the shear spinning of approximately 900 preforms and 6 preforms materials. Each preform and its resulting as-spun piece received a total of more than three dozen dimensional measurements of the I.D. and wall thickness. The preform alloys included 6061 Al alloy, Timken 17-22A(s) alloy steel, Type 321 stainless steel, N-155 and Inconel X high temperature alloys, and 6% Al 4% V-Ti alloy. The dimensions, composition, and metallurgical characteristics of the preform alloys are shown. Also described is the tentative terminology for the shear spinning process and the design and construction of the machine used for the program. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-258 623 Div. 28, 23
(28 June 61) OTS price $2.60

Princeton U., N. J.
THE INTERACTION BETWEEN STAGES OF DEVELOPMENT AND TRAINING METHODS,
by Harold M. Schroder. May 61, 24p. incl. tables, 17 refs. (Technical rept. no. 8)
(Contract Nonr-185812, Proj. NR 171-055)
Unclassified report

Presented as part of Symposium on Personality Organization through Conceptual Structure, at Society for Research in Child Development meeting, Pennsylvania State U., March 18, 1961.

DESCRIPTORS: *Symposia, Personality, *Training, Adjustment psychology, Behavior, Reasoning, Learning, *Sociometrics, Stimulation, *Psychometrics, Attitudes, Culture, Group dynamics, *Training devices, Training films, Social communication.

AD-258 629 Div. 28
(28 June 61) OTS price $1.60

Texas A. and M. Research Foundation, College Station.
ADAPTATION LEVEL THEORY, PERSONALITY AND SMALL GROUP DYNAMICS,
by Warren C. Bonney and Clay E. George. Sep 60, 18p. incl. tables (Technical rept. no. 4)
(Contract Nonr-211901, Proj. NR 174-054; In cooperation with Arizona State U.)
Unclassified report

DESCRIPTORS: *Adjustment (Psychology), Personality, *Group dynamics, Theory, Stimulation, Design, Effectiveness, Behavior, Personality tests, Test methods, Colors, Measurement.

An instrument is being constructed for the measurement of affective adaptation, (Picture Preference Series), a determination of the relationship of various personality variables to picture preference responses, and a theoretical reordering of behavioral data in terms of adaptation level. The studies have been conducted within the experimental framework provided by Helson's Auaptation Level (AL) formulation. The Picture Preference Series consists of a set of slides depicting simple forms such as fruits and domestic animals. The forms are presented in the series as achromatic (outline), appropriately colored, and inappropriately colored stimuli. Important advances in color psychology are (a) the development of a series of stimuli scaled for appropriateness and (b) the new scoring technique for measuring adaptation to A and I stimuli. In small group dynamics, studies showed the value of the approach and more sophisticated designs have been developed. Plans call for at least one

trial with a new design during the coming year. Work on judgments of oral performances indicated that even trained judges cannot differentiate well between the middle ranges of such performances. Experiments on intellectual efficiency indicate considerable promise. (Author)

AD-258 705 Div. 28
(28 June 61) OTS price $5.00

Institute for Applied Experimental Psychology, Tufts U., Medford, Mass.
HUMAN ENGINEERING BIBLIOGRAPHY 1958-1959.
Oct 60, 1v. 2126 refs.
(Contract Nonr-49413)
(Rept. no. ACR-55) Unclassified report

DESCRIPTORS: *Human engineering, Indexes, *Bibliography.

Personnel responsible for the human factors considerations in the design and development of equipment have a major need for rapid and easy access to the literature pertinent to their work. This bibliography is one of a planned series of annual bibliographies of literature pertinent to human engineering. This bibliography is divided into 5 parts: (1) a topical outline which defines over 350 topic headings established for this bibliography, (2) an index which associates the approximately 1900 bibliographic entries with the topic headings, (3) an alphabetic index of the common search terms which would aid those using this bibliography but who are unfamiliar with the topic headings, (4) an annotated bibliography of some 1900 citations, and (5) an index of the authors of these citations. (Author)

AD-258 854 Div. 28
(30 June 61) OTS price $7.60

Arizona State U., Tempe.
PERCEPTION (IN EXPERIMENTAL FOUNDATIONS OF CLINICAL PSYCHOLOGY),
by Israel Goldiamond. 1961, 66p. incl. tables, 150 refs.
(Sponsored by the Electronic Systems Div., Air Force Systems Command)
(ESD TR 61-21) Unclassified report

DESCRIPTORS: *Psychology, Stimulation, Conditioned reflexes, Analysis, Sensory perception, *Behavior, *Perception, Tests, Theory, Personality, Signals, Detection, Intelligibility, Factor analysis, Psychoses, Scheduling, Language, Speech, Measurement, Education, Speech representation, Visual perception.

This report is to appear as a chapter in the forthcoming book, The Experimental Foundations of Clinical Psychology, edited by Arthur Bachrach, to be published by Basic Books. Perception is defined procedurally, rather than as a variable or state intervening between stimulus and response classes, and the implications of this definition are considered, with special reference to some clinical areas. Although this applied area is singled out, the procedural orientation may have implications for other areas, since it is concerned with more general issues. These issues are raised by application to perceptual and monitoring situations of the experimental analysis, maintenance, and controlled alteration of behavior. The effects upon perceptual formulations of current advances related to communications and conditioning research are considered, and are applied to training, research, and other analytical problems. Specific consideration is given to the Theory of Signal Detection, operant conditioning research in discrimination, and generalization, and other recognition and verbal behavior (word) research. (Author)

AD-258 939 Div. 28
(3 July 61) OTS price $4.60

Naval School of Aviation Medicine, Pensacola, Fla.
BIBLIOGRAPHY: PSYCHOLOGICAL RESEARCH IN THE U.S. NAVAL SCHOOL OF AVIATION MEDICINE - JULY 1950-JUNE 1960,
by Richard E. Doll and James R. Berkshire. 6 Feb 61, 41p. 500 refs.
Unclassified report

DESCRIPTORS: *Bibliography, Acoustics, Psychoacoustics, Aviation personnel, Training, Attitudes, Perception, Tests, Selection, Leadership, Vision, Safety, Indexes, *Psychology.

Approximately 500 psychological research publications are listed under the headings of Acoustics, Anxiety, Attitudes, Grades and Standards, Morale, Peer Ratings, Perception, Selection, Methodology, Safety, Tests, Training, Vision, and Miscellaneous. Author index is included. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-258 580 Div. 29, 26
(27 June 61) OTS price $3.60

Quartermaster Corps, Washington, D. C.
COMPUTATIONAL PROCEDURES FOR OBTAINING MODULAR NUMBERS,
by T. N. E. Greville. Dec 60, 30p. incl. tables.
(Operational mathematics series rept. no. 4)
Unclassified report

DESCRIPTORS: *Numerical methods and procedures, *Packaging, Operations research, Supplies, Logistics, Army operations.

A modular number is defined as an optimum package size for a supply item that will minimize handling effort in supplying one item to each a number of consumers grouped into various units of known sizes. Two different criteria for expressing numerically what is meant by minimizing handling effort are suggested. If high-speed computing facilities are available, the determination of the modular number under either criterion could be carried out by a brute force technique. However, if the computations must be made manually (perhaps with the aid of a desk calculator), short-cuts are desirable. Two types of step-by-step procedures oriented toward manual computation are developed. Either procedure can be adapted to either of the criteria proposed by the QM Board. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-258 360 Div. 30, 6
(20 June 61) OTS price $5.60

Packard-Bell Electronics Corp., Los Angeles, Calif.
RADAR TEST SET AN/APM-123(XC-1) AND RADAR TEST SET TS-1314(XC-1)/U,
by C. F. Deininger. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, 31 Mar 61, 55p. incl. illus. (Rept. no. 10451-3)
(Contract DA 36-039-sc-85185)
Unclassified report

DESCRIPTORS: *Test sets, Radar equipment, Test equipment, *Radar beacons, Identification systems, Design, Tests, Power supplies, Printed circuits, Frequency multipliers, Airborne.

Research was continued on the development of radar test sets AN/APM-123(XC-1) and TS-1314(XC-1)/U. The problem of excessive rise time in the RF pulse envelope of the APM-123 was solved. This problem occurred because of improper grounding of the coaxial cable shield to the cable connector used at the L-band cavity output jack. All plug-in units as well as the RF multiplier were fabricated. The low voltage power supply and the interconnecting board were also fabricated. (Author)

AD-258 361 Div. 30, 16
(23 June 61) OTS price $1.60

Naval Medical Research Unit No. 4, Great Lakes, Ill.
STANDARD VALUES AND VARIATIONS FOR PAPER STRIP ELECTROPHORESIS,
by Ralph I. Lytle, J. Young, and W. T. Stille.
2 May 61, 10p. incl. tables.
(Proj. MR 005.12-1102.1)
Unclassified report

DESCRIPTORS: *Electrophoresis, Proteins, *Analysis of variance, Paper, Man, Serum, Analysis.

Results of an 8 x 8 Latin square design controlling several variables in paper strip electrophoresis (Spinco procedure) indicates that determinations of a single trial or run are unique. Hence, care must be used in comparing determinations obtained from two different runs. Within a single run, there is no evidence that the position of any strip on the apparatus results in an obvious bias. An analysis of variance of these data yields estimates of the standard deviations associated with each serum protein component for several anticipated comparisons. (Author)

AD-258 396 Div. 30, 8
(23 June 61) OTS price $10.50

Stoddart Aircraft Radio Co., Hollywood, Calif.
DEVELOPMENT OF TRANSISTORIZED AND MODERNIZED INTERFERENCE MEASURING SET AN/PRM-1 (XN-2).
Final rept. for 5 May 58-8 Apr 60 on Phase 1 of Task 2, 8 Apr 60, 1v. incl. illus. tables.
(Contract NObsr-72677)
Unclassified report

DESCRIPTORS: *Radio interference, Measurement, *Test sets, Test equipment, Electronic circuits, Transistors, Design, *Radio receivers, Radio equipment, *Radio interference analyzers, Tests, *Radio interferometers, Signal to noise ratio, Audio amplifiers, Intermediate frequency amplifiers, Voltmeters.

A detailed description is presented of a transistorized interference measuring set AN/PRM-1(XN-2) Completely redesigned transistorized circuits were developed for the RF, IF, detector and voltmeter amplifier systems. Evaluation tests were performed and the general and factual data resulting from these tests are described. Also included are studies and comments upon the various aspects of the transistorized circuitry. Recommendations are given for improvement in the existing transistorized circuitry based upon the experience gained in the test performance. Specific requirements for construction of prototype models are given. (Author)

AD-258 438 Div. 30, 17
(19 June 61) OTS price $2.60

Watertown Arsenal Labs., Mass.
THE EFFECT OF SPECIMEN GEOMETRY ON DETERMINATION OF ELONGATION IN SHEET TENSILE SPECIMENS,
by Eric B. Kula and Norbert H. Fahey. Technical rept. on Industrial Preparedness Measurement - Product Improvement. May 61, 21p. incl. illus. tables (Rept. no. WAL TR 111/26)
Unclassified report

DESCRIPTORS: *Sheets, Deformation, *Tensile properties, Test methods, Copper, Steel, Thickness, Specifications, Quality control, Alloys, Mechanical properties.

The influence of specimen thickness and width on the elongation in 2 in. was studied on copper, AISI 1020 steel, and heat-treated H11 steel. The results conform approximately to Templin's (R. L. Templin, Am. Soc. Testing Materials, 26: part 2, 378, 1926) equation, El equals C A superscript n. The constant n, a measure of the variation of elongation in 2 in. with specimen area, is shown to be related to the log of the ratio of the zero gage length (fracture strain) to the infinite gage length (uniform strain) elongations. A method is shown for predicting the elongation in 2 in. for a bar of any thickness (or width) from measurements on another bar of the same material. The reason for specimen area being of greater importance than absolute values of width or thickness in controlling elongation is demonstrated by studying the strain distribution near the fracture. The methods outlined will enable specification and inspection personnel to determine how elongation values will vary with sheet thickness. (Author)

AD-258 451 Div. 30
(21 June 61) OTS price $23.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE M-2 HIGH-SPEED COMPUTER (Bystrodeystvuyushchaya Vychislitel'naya Mashina M-2),
by M. A. Kartsev, T. M. Aleksandridi and others. 20 Mar 61, 470p. incl. illus. tables (Trans. no. MCL-162 from Gosudarstvennoye Izdatel'stvo Tekhniko-Teoreticheskoy Literatury, Moscow: p. 228., 1957)
Unclassified report

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

DESCRIPTORS: *Digital computers, Circuits, Numerical analysis, Memory devices, Magnetic recording systems, Programming, Computers, Data storage systems, USSR.

A description is presented of the compact M-2 high-speed computer designed by the Laboratory for Control Computers and Systems of the Academy of Sciences of the USSR. A detailed discussion of the basic units of the machine (arithmetic unit, internal storage units, control unit, and external storage units) is preceded by chapters which set forth the general principle of the machine's construction, its system of number representation and programming, and the layout of the basic elements of its circuits. (Author)

AD-258 459 Div. 30
(21 June 61) OTS price $11.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio
BROCHURES ON ELECTRONIC COMPUTERS AND INSTRUMENTS,
19 Jan 61, 142p. incl. illus. (Trans. no. MCL-407 from Tsentral'noye Byuro Tekhnicheskoy Informatsii, Moscow: 70p.)
Unclassified report

DESCRIPTORS: *Analog computers, *Digital computers, Electronic equipment, USSR, Computers.

AD-258 480 Div. 30, 1
(21 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
COMPUTERS,
24 Feb 61, 43p. incl. illus. table, 21 refs. (Trans. no. MCL-756 of Standard Elektrik Lorenz, Stuttgart: pp 2-4, 1-14, 1960)
Unclassified report

DESCRIPTORS: *Computers, Flight paths, *Radar, Display systems, Radar signals, *Data processing systems, *Data storage systems, *Data transmission systems.

This rept. includes:
REMOTE TRANSMISSION SYSTEM FOR RADAR DISPLAYS, FAB 6072, AS BUILDING BLOCK OF A FLIGHT-PATH COMPUTER. 27 Sep 60, 6p.

DEVELOPMENT OF A SYSTEM FOR BROAD-BAND COMPRESSION OF RADAR SIGNALS BY MEANS OF STORAGE CAPACITORS, AND THEIR POSSIBILITIES OF APPLICATION, by K. Jekelius. 1960, 1v. incl. illus. table.

FLIGHT PATH COMPUTER, LONG-DISTANCE TRANSMISSION UNIT FOR RADAR DISPLAYS FAB 6072. 1960, 5p. incl. illus.

AD-258 553 Div. 30, 22
(27 June 61) OTS price $8.10

Institute of Aerophysics, U. of Toronto (Canada).
SOME METHODS OF GENERATING CYLINDRICAL EXPLOSIONS, by Richard Collins. Nov 60, 36p. illus. table, 17 refs. (UTIA technical note no. 43)
(Sponsored by Office of Naval Research)
Unclassified report

DESCRIPTORS: *Explosions, *Shock waves, Blast, Configuration, Production, Glass, Cylindrical bodies, Diaphragms (Mechanics), Schlieren photography, Test equipment, Air, Spheres, Explosive gases, Hydrogen, Oxygen.

Methods were developed for generating cylindrical explosions by bursting pressurized glass cylinders. The cylindrical diaphragms (2 or 4 in. diam) are initially pressurized with air or with a combustible gas mixture. The cylindrical blast is produced by breaking the diaphragm with a mechanical breaker or igniting the mixture with an exploding wire and letting the cylinder break due to overpressure. The records include schlieren wave-speed traces of the time-distance plane as well as multi-spark schlieren photographs of the physical plane which can be taken at the equivalent framing rate of up to 250,000 pictures per second. Measurements are made of the rate of decay of the cylindrical shock velocity with time. Comparison with an existing approximate theory by Chisnell (J. Fluid Mech., 2:286, 1957) shows good agreement except for shock speeds near the origin of the blast. (Author)

AD-258 573 Div. 30, 12, 22
(27 June 61) OTS price $4.60

Naval Ordnance Test Station, China Lake, Calif.
BALLISTIC FORMULAS FOR TRACK CARRIAGES,
by D. M. Nelson and D. P. Ankeney. 24 Jan 56 rev. 15 Mar 61. 38p. incl illus. (NOTS TP 2637 supersedes NOTS 1330, AD-98 223)
(NAVORD rept. no. 4998, rev. 1 supersedes NAVORD rept. no. 4998, AD-98 223) Unclassified report

DESCRIPTORS: *Ballistics, *Rocket propelled sleds, *Tracks (Aerodynamics), Test vehicles, Water brakes, Mathematical analysis, Drag, Aerodynamics, Aeronautics, Mathematical prediction.

Some methods and techniques for determining track-carriage ballistics are presented. The determination of ballistics for the acceleration, sustain, coast, and braking phases are discussed, and formulas facilitating calculations for each of these phases are included. (Author)

AD-258 582 Div. 30, 8
(26 June 61) OTS price $1.60

PRD Electronics, Inc., Brooklyn, N. Y.
8.5 R-F CONNECTOR TEST SET,

by L. A. Nadler. Interim engineering rept no. 4, 1 Mar-31 May 61. 31 May 61, 13p. incl. illus. tables.
(Contract NObsr-81373)

Unclassified report

DESCRIPTORS: *Electric connectors, *Test sets, Backward-wave oscillators, Display systems, Coupling circuits, Standing wave ratios, Adapters, Reflectometers, Sweep generators, Radiofrequency, Measurement, Electronic circuits.

Progress on the BWO signal source is described and a new commercially available electronic divider circuit for use as a ratiometer is discussed. The details of measurement of the engraved slots for the directional coupler Tchebycheff array are given and a new fabrication technique using etching procedures is given. Detailed progress on the slab-line load, RF connector terminations, and adapters is presented. (Author)

AD-258 602 Div. 30, 14
(27 June 61) OTS price $8.60

Washington State U., Pullman.
DEVELOPMENT OF A NON-DESTRUCTIVE TEST FOR THE ADHESIVE BOND IN WOOD SCARF JOINTS,
by B. A. Jayne and W. L. Galligan. Final rept. 15 May 61, 84p. incl. illus. tables (Research rept. no. 61/15-69)
(Contract NObs-78267)

Unclassified report

DESCRIPTORS: *Wood, Joints, Adhesives, Bonding, *Non-destructive testing, *Bonded joints, Adhesion, Test methods, Test equipment, Vibration, Damping, Ultrasonics, Piezoelectric effect, Piezoelectric gages, Tensile properties, Shear stresses, Torque, Electrical properties, Measurement.

A series of 120 scarf-joint specimens prepared from selected Douglas fir were made with 4 types of glue-line defects in addition to non-defective control specimens. Each joint was inspected non-destructively (1) in double vibration, (2) by transmission of ultrasonic energy, and (3) electrically. The specimens were then tested to failure in bending, torsion, shear, and tension; attempts were made to correlate the results. With the vibration method the higher mass ratio of wood to glue masked the contribution of the glue bond to over-all joint characteristics. With the ultrasonic data, the specimens could be segregated into relative quality classes, but individual defective joints could not be consistently segregated. The segregation of joints by the electrical test was also qualitative. The development of 2 new tests, shear and torsion, improved the quality of the destructive testing. The non-destructive test data were not indicative of a proven quality measurement method.

AD-258 639 Div. 30, 2
(28 June 61) OTS price $1.60

Army Electronic Proving Ground, Fort Huachuca, Ariz.
TABLES FOR COMPUTATION OF DATA FROM NET AND TOTAL RADIOMETERS,
by Glenn E. Daniels. Technical memo. Dec 60, 16p. incl. tables (Rept. no. AEPG-SIG 970-37)

Unclassified report

DESCRIPTORS: *Radiometers, *Meteorological instruments, Radiation counters, Radiation instruments, Tables, Equations, Temperature.

Equations have been derived and tables prepared to simplify the computation of total and net radiation data from radiometers of the Gier-Dunkle type. (Author)

AD-258 672 Div. 30, 8
(28 June 61) OTS price $3.60

Naval Research Lab., Washington, D. C.
PORTABLE PRECISION FREQUENCY METER AND PRECISE SIGNAL GENERATOR,
by J. E. McGeogh and G. K. Jensen. Final rept. 17 May 61, 39p. incl. illus. (NRL rept. no. 5604)

Unclassified report

DESCRIPTORS: *Frequency meters, *Signal generators, Design, Naval equipment, Laboratory equipment, Frequency dividers, Frequency multipliers, Oscillator circuits, Video amplifiers, Low pass filters, Power supplies, Electronic circuits, Measurement, Test equipment, Narrowband, Radiofrequency filters, Radiofrequency, Crystal oscillators.

A laboratory model of a precise frequency meter and signal generator intended primarily for portable operation was developed, constructed, and measured. The model is 1.5 cu ft, weighs 43 lb, and uses a separate power supply. It provides frequency measurement in the 0 to 1 mc range on band 1 to an accuracy within 1 ppm when using the internal reference or to an accuracy equal to that of an external 100-kc reference. A method for extending operation to the next 3 higher decade ranges was provided for, although it is not constructed in the laboratory model. Although the model was originally intended for use only as a frequency meter, the chosen method of measurement incorporates a precise, direct-reading, 6-decade frequency generator which may be used as a signal generator. Care has been exercised to provide an output signal with all extraneous frequencies attenuated to a level much lower than required in the frequency meter, in order that the unit may also be used as a highly accurate, direct-reading decade signal source. The instrument may then be used as a driver for other equipment or as a laboratory instrument. (Author)

AD-258 674 Div. 30, 6, 9
(28 June 61) OTS price $5.60

Naval Ordnance Lab., White Oak, Md.
THEORY, DESIGN AND CALIBRATION OF A NEW ULTRASONIC DENSITOMETER,
by J. F. Daugherty. 6 Mar 61, 51p. incl. illus. (NAVWEPS rept. no. 7399)

Unclassified report

DESCRIPTORS: *Density, Calibration, Measurement, Theory, Liquids, Sound transmission, Mathematical analysis, Ultrasonics, Design, Temperature, Pressure, *Detectors, *Acoustic impedance.

A new type of densitometer was constructed and is being assembled and calibrated. The measurement of the specific volume of liquids as a function of temperature and pressure utilizing

ultrasonic techniques of sound speed measurement are discussed. Sound speed was measured to an accuracy of one part in 7,000 in water as a function of temperature, pressure, and salinity over nominal temperature and pressure ranges of 0 to 100 C and 14.7 to 15,000 psia, respectively. An analysis of the densitometer indicates an expected accuracy in specific volume measurements near one part in 10,000 over these same ranges of temperature and pressure. The general methods of calibrating this instrument are also reported. (Author)

AD-258 715 Div. 30, 2
(29 June 61) OTS price $1.60

Laboratory of Climatology, Centerton, N. J.
THE MEASUREMENT OF CLIMATIC FLUXES,
by C. W. Thornthwaite. 31 May 61, 19p. incl. illus. tables, 20 refs. (Technical rept. no. 1)
(Contract Nonr-299700, Proj. NR 389-101)
Unclassified report

Presented at the 193rd National Meeting of the American Meteorological Society, Davis, Calif., 20-22 June 1961.

DESCRIPTORS: Meteorology, *Meteorological instruments, Direction finding, *Vertical gust recorders, Vertical indicators, Wind direction indicators, *Anemometers, Meteorological data, Measurement, Air mass analysis.

Instruments for the direct measurement of horizontal and vertical wind were incorporated into new instrument systems for measuring the fluxes of momentum as well as of sensible heat and atmospheric humidity. The anemometer cups for sensing the horizontal wind are of light weight molded plastic which are attached by stainless steel spokes to an aluminum hub. The entire cup assembly weighs only 7 grams. The shaft to which it is attached is of hardened stainless steel rotating within two rings of miniature ball bearings and pivoted at the lower end on a hardened steel plate. A shutter is mounted at the base of the shaft so as to interrupt a beam of light from a miniature lamp to a photocell housed in the horizontal anemometer support. The electrical output of the photocell is amplified and used to actuate an electromechanical counter, each revolution of the cup assembly registering one count. (Author)

AD-258 748 Div. 30, 15
(29 June 61) OTS price $3.60

Research Inst., U. of Michigan, Ann Arbor.
THE THEORY OF ELECTRONIC RANDOM SELECTORS,
by G. A. Roberts. Dec 60, 32p. incl. illus. (Technical rept. no. 115; rept. no. 2699-37-T)
(Contract DA 36-039-sc-78283, Proj. 3A99-06-001-01)
Unclassified report

DESCRIPTORS: *Probability, *Computers, *Numerical methods and procedures, Numerical analysis, Statistical tests, Theory.

Electronic random selectors were developed as a part of the over-all N. P. Psytar program (Noise Programmed Psycophysical Tester and Recorder). The input to a random selector is a request that a selection be made. This request is called a question, and the time at which it is made is called the question time. The output of a random selector is a selection from a set of possibilities. The probability of selection for each of the members of a set of possibilities is established prior to the question time. Any random selector or random-number generator can be thought of as having two main parts: a probability control; and a randomness generator. In this report the randomness requirements are set forth; the theory of the probability control is described with the assumption that the input is a random function of time; the theory of generating this random input is described; and predictable binary-sequence generators are mentioned. (Author)

AD-258 782 Div. 30, 22, 24, 25
(5 July 61) OTS price $7.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
DEVELOPMENT OF HYPERVELOCITY RANGE TECHNIQUES AT ARNOLD ENGINEERING DEVELOPMENT CENTER,
by J. Lukasiewicz, W. B. Stephenson and others. June 61, 74p. incl. illus. table, 22 refs. (Rept. no. AEDC TR 61-9)
(Contract AF 40(600)800)
Unclassified report

Presented at the ARPA-ARGMA-CARDE Symposium on Aeroballistic Ranges, Quebec, June 29-30, 1961.

DESCRIPTORS: *Hypervelocity projectiles, *Hypersonic wind tunnels, Design, Instrumentation, Gun launched, Projectiles, Optical equipment, Telemeter systems, Pressure, Measurement, Velocity, Spark shadowgraph photography, Launching, Photographic equipment, Cameras, Photographic filters, Interior ballistics, Gas flow, *Test facilities, Ballistics, *Hypervelocity guns.

Development of a hypervelocity launcher and range instrumentation in preparation for operation of a 1000-ft aeroballistic facility is described. A method was evolved for the gas-dynamics design of 2-stage, light gas launchers. Performance, limitations, and mechanical design features of such launchers are discussed. Instrumentation developments include: (1) projectile radiation actuated detector and spark trigger, (2) simple, Fresnel-lens shadowgraph performing satisfactorily at projectile speeds of 26,000 ft/sec, (3) telemeter capable of transmitting model pressure measurements at launch accelerations of 200,000 g, and (4) microwave velocity measuring technique. (Author)

AD-258 932 Div. 30, 2, 8, 25
(30 June 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
AN INSTRUMENT FOR CONTINUOUS DEEP-SEA MEASUREMENT OF VELOCITY OF SOUND, TEMPERATURE, AND PRESSURE,
by J. R. Lovett and S. H. Sessions. 9 May 61, 24p. incl. illus. tables (NOTS TP 2673)
(NAVWEPS rept. 7650) Unclassified report

DESCRIPTORS: *Sound, *Temperature, *Pressure, Velocity, Measurement, *Instrumentation, Electronic equipment, Design, Oceans, Underwater sound, Sound transmission, Underwater sound transmission.

An electronic instrument for the continuous and concurrent measurement in the ocean of velocity of sound, temperature, and pressure has been designed and tested to depths in excess of 2,000 meters. This 70-lb transistorized instrument contains three sections: a modified NBS velocimeter for measuring velocity of sound, a Borg-Warner Vibrotron for pressure, and a NOTS thermistor-controlled Wien-bridge oscillator for temperature.

Outputs from the 3 sections are fm signals, mixed for single-conductor cable transmission to the surface. Velocity of sound is transmitted in the band 2,775-3,225 cps, temperature in the band 5,000-8,000 cps, and pressure in the band 9,712-11,288 cps. Accuracy of measurement is sound velocity 0.3 m/sec, temperature 0.02 C, and pressure 1% in selected ranges of 0-1,000 and 0-2,000 psi. (Author)

AD-258 964 Div. 30, 5, 8
(30 June 61) OTS price $8.60

Stoddart Aircraft Radio Co., Hollywood, Calif.
DEVELOPMENT OF INTERFERENCE MEASURING SET (1 TO 10 KILOMEGACYCLES) (AN/URM-138(XN-1)),
by J. R. Mahoney. Final engineering rept. 6 Jan 60-28 Feb 61. 28 Feb 61, 85p. incl. illus. (Contract NObsr-81133)
Unclassified report

DESCRIPTORS: *Radio equipment, *Test sets, Radio interference, Measurement, Radio waves, *Radio interference analyzers, Antennas, Radio, Radiofrequency attenuators, Radiofrequency filters, Oscillators, Calibration, Display systems, Power supplies, Transistors, Waveguides, Amplifiers, Video amplifiers, Sensitivity, Tests, Intermediate frequency amplifiers.

Work accomplished to improve performance of the Radio Test Set AN/URM-42 (Radio Interference and Field Intensity Measuring Equipment) is reported. An RF turret attenuator was designed and included in the circuit to extend the overload capability of the system. An impulse calibrator was developed which provided accurate calibration over the entire frequency range. Low pass filters were introduced to reduce spurious responses. The introduction of ferrite isolators in front of each RF tuner greatly reduced oscillator radiation and input VSWR. The new equipment has an impulse bandwidth five times greater than the original equipment. A wideband video output which delivers modulation products in the frequency range of 20 cycles to 2.5 mc enables the operator to magnetically record or visually examine the demodulated signals being measured. The rise-time of the AN/URM-138(XN-1) is approximately 0.14 microseconds against the one microsecond rise-time of the AN/URM-42. A metering circuit with a fast and slow response time is included in the circuit. A transistorized power supply with good regulation is an integral part of the equipment. (Author)

AD-258 974 Div. 30, 32
(30 June 61) OTS price $15.50

Syracuse U. Research Inst., N. Y.
INVESTIGATION AND STUDY OF GRAPHIC-SEMANTIC COMPOSING TECHNIQUES,
by Carson P. Buck, R. Ford Pray, and Gerald W. Walsh. Final rept. 1 July 59-30 Apr 61. June 61, 1v. incl. illus. (SURI rept. no Eng. 695-615F) (Contract AF 30(602)2091)
(RADC TR 61-58) Unclassified report

DESCRIPTORS: *Language, *Machine translation, *Data processing systems, *Data storage systems, Automation.

The automatic processing of illustrations and graphical data, such as charts, graphs, schematics, and formulae, presents a unique problem in the machine translation of a foreign language publication. This problem may be broken down into six steps, each of which is considered to be a machine operated function: (1) Discernment of the data; (2) Read-off of the data (screening); (3) Translation, if necessary, of verbal or symbolic information which is a part of the data; (4) Recomposition of the graphical data in proper correlation with translated semantic information which it illustrates; (5) Print out of the results of composition into single or multiple hard copy form; and (6) Provision for the storage of results for future retrieval and use. An investigation was made of both existing and potential methods that might be used to achieve the functions indicated in Steps 1, 2, 4, 5, and 6. It has been proven that a variety of existing methods could feasibly be combined to partially solve the problem for the immediate future. Also, it is considered feasible, based on the results of this investigation, to achieve fully automated systems for translation or data processing in the not too distant future. (Author)

AD-258 978 Div. 30, 8
(5 July 61) OTS price $1.10

Aerospace Corp., El Segundo, Calif.
TWO NEW CIRCUITS USED IN THE MHD TURBULENCE FACILITY TRIGGERING AND DELAY UNIT,
by E. B. Turner and R. C. Phillips. 16 Mar 61, 5p. incl. illus. (Rept. no. TDR-594(1208-02)TN-1) (Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Electronic circuits, *Delay circuits, Thyratrons, Diodes, Turbulence, *Test facilities, *Trigger circuits, *Laboratory equipment.

Two new circuits used with the MHD turbulence facility are described and their operation is explained. The first circuit is an L-C delay circuit utilizing a diode to produce a sharp spike at the end of a half cycle. The second circuit is used for shorting out the grid spike that occurs when a high-voltage thyratron breaks down. It is thought that these 2 circuits will be of considerable use in the type of work being done in this laboratory. (Author)

AD-258 992 Div. 30
(6 July 61) OTS price $1.60

California U., Los Angeles.
PARALLELISM IN COMPUTER ORGANIZATION RANDOM NUMBER GENERATION IN THE FIXED-PLUS-VARIABLE COMPUTER SYSTEM,
by M. Aoki, G. Estrin, and T. Tang. 1960, 16p. incl. illus. tables.
(Sponsored by Office of Naval Research)
Unclassified report

DESCRIPTORS: *Numerical methods and procedures, *Digital computers, Circuits, *Electronic circuits, Sampling, Statistical tests, Statistical processes.

Special purpose circuits can be designed to generate pseudo-random numbers in parallel with other activities such that these numbers are available on demand in the same sense as any other operand stored for use in the computation. A number of different methods of generating pseudo-random numbers, the time required in existing programs, the hardware implications of different parallel and serial designs are discussed. The criteria for choice of one method over another in the context of particular problems and the Fixed-Plus-Variable Computer System are evaluated. (Author)

Division 31 - SHIPS AND MARINE EQUIPMENT

AD-259 010 Div. 30, 19
(6 July 61) OTS price $2.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
A FEASIBILITY STUDY FOR A SHIPBOARD DATA COLLECTION SYSTEM,
by Herbert Kaufman and Raymond Spong. Final rept. 15 Dec 60, 18p. incl. tables (Rept. no. SPD 60-128; P60-224)
(Contract Nonr-264000)

Unclassified report

DESCRIPTORS: *Data processing systems, *Data storage systems, Automatic, *Shipborne, *Submarines, Velocity, Time, Collecting methods, Naval operations, Naval vessels, *Navigation computers, Plotters, Analog-to-digital computers, Antisubmarine warfare, Computers, Navigation.

Research is presented on a feasibility study of a shipboard data collection system. The first section describes the background of the study. The second section contains a description of the system that Electric Boat suggested in its proposal; it also contains a description of the system for collecting and recording ship speed, course, and elapsed time which was designed and assembled by Electric Boat's Human Factors Section and delivered to SubDevGru Two for installation on two submarines. The third section of this report describes the IBM 704 program developed by Electric Boat's Digital Computer Services Division for post-exercise reconstruction of ship tracks from data recorded during operations at sea. (Author)

AD-259 017 Div. 30, 9
(6 July 61) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
THE MEASUREMENT OF PRESSURE FLUCTUATIONS IN A HYPERSONIC WIND TUNNEL,
by M. D. Brown and P. L. Clemens. June 61, 46p. incl. illus. tables (Rept. no. AEDC TN 61-64)
(Contract AF 40(600)800)

Unclassified report

DESCRIPTORS: *Hypersonic wind tunnels, Wind tunnels, Hypersonics, Tests, Pressure, Oscillation, Instrumentation, Measurement, Temperature.

The measurements of pressure fluctuations in a continuous-flow, hypersonic wind tunnel at Mach number 8.08 are described. The prime objective of the measurements was to determine amplitudes and frequencies of the various components of pressure fluctuation and to establish the accuracy with which such measurements might be made. A description of the measurement apparatus, its mode of use, and a sampling of typical pressure fluctuation measurements are presented. Merit factors, providing convenient numerical descriptions of such pressure fluctuations as were encountered, are defined. The test results were used in the assignment of values to these merit figures. Limited accuracy among the test results indicates the need for a dynamic pressure calibration apparatus of wide frequency and amplitude capability. The method used in calibrating the data readout equipment is presented. A treatise on the response of analog readout instruments to input signals representable by time-varying function is also presented. (Author)

AD-259 023 Div. 30, 16
(6 July 61) OTS price $4.60

Cornell U., Ithaca, N. Y.
ANALYSIS AND SIMULATIONS OF A NERVE CELL MODEL,
by Carl Kesler. Rept. no. 2 on Cognitive Systems Research Program. (Master's thesis). 1 May 61, 48p. incl. illus. table.
(Contract Nonr-40140)

Unclassified report

DESCRIPTORS: *Cybernetics, *Computers, Simulation, *Linear programming, Learning, Reasoning, Data storage systems, Data processing systems, Theory.

Nerve cell models are mathematical models of biological neurons. In the analysis of such systems inequalities are often encountered. In the nerve cell model to be discussed, the cell is either active or inactive depending on the weighted inputs to the cell and its threshold. The ability of two types of cell networks to separate a group of stimuli into two classes is the topic of theorems 7-11. Some computer simulations are described. (Author)

AD-259 036 Div. 30, 5, 22, 25
(12 July 61) OTS price $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
REPRODUCE INSTRUMENTATION FOR PROJECT 6.2 OPERATION PLUMBBOB,
by J. C. Headley. 1 May 61, 36p. incl. illus. table (DOFL rept. no. TR-931)
(Proj. no. 23300)

Unclassified report

DESCRIPTORS: Magnetic effects, *Nuclear explosions, Instrumentation, *Electromagnetic fields, Recording systems, *Recording devices, *Magnetic recording systems, *Magnetic tape, Magnetic fields, Low frequency, Amplitude modulation, Frequency modulation, Reproduction, Voltage amplifiers, Radiofrequency amplifiers, Oscilloscopes.

A magnetic tape recording system was developed in connection with attempts made to measure magnetic components of the electromagnetic field associated with nuclear detonation. The instrumentation described is considered satisfactory for the reproduction of data taken with this recorder, specifically those data recorded on Project 6.2 Operation Plumbbob. (The system was also applicable for reproducing Hardtack tapes). A seven-channel reproduce system was designed and constructed with capabilities to (1) reproduce magnetically-recorded signals over a frequency range from several c to over 200 kc within ±1 db; (2) play back an AM and FM channel simultaneously; (3) obtain quick-look data reduction in the field; and (4) accomplish complete data analysis in the laboratory. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-258 739 Div. 31, 5
(29 June 61) OTS price $1.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
PROJECT SUBIC. SHIP CONTROL VIII. SINGLE-ELEMENT VS. TWO-ELEMENT DISPLAY IN TWO-DIMENSIONAL TRACKING,
by Bret A. Charipper. Feb 59, 7p. incl. illus. tables (Technical rept. no. SPD 59-003; P59-009)
(Contract Nonr-251200)

Unclassified report

DESCRIPTORS: *Submarine simulators, Instrumentation, *Control systems, Design, Display systems, Control, *Instrument panels, Tests, Errors, Depth indicators, Submarines.

Sixty male Naval officers and petty officers, ten in each of six experimental conditions, were required to control a simulated submarine, simultaneously, in course and depth. Performance using a single-element display was compared with performance using a two-element display. The results indicate that performance is better when course and depth errors are combined into a single indicator than when there is a separate indicator for each. The superiority of the single-element display was demonstrated with each of three different control configurations. The average performance with the single-element display was from 11.2 to 15.3% more accurate in maintaining course and from 6.7 to 14.4% more accurate in maintaining depth than average performance with the two-element display using the same control. (Author)

AD-258 749 Div. 31, 6
(29 June 61) OTS price $1.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
PROJECT SUBIC. SHIP CONTROL IV. AN EMPIRICAL EVALUATION OF THE UTILITY OF A PITCH-RATE INDICATOR IN SUBMARINE DEPTH CONTROL,
by Raymond C. Sidorsky and John M. Newton. Dec 58, 9p. incl. illus. tables (Technical rept. no. 411 HF-21; P58-217)
(Contract Nonr-251200)

Unclassified report

DESCRIPTORS: Submarine simulators, Submarine personnel, Tests, *Display systems, *Depth indicators, *Depth finding, Control systems, Control panels, Effectiveness, Instrumentation.

Seven operators performed simulated depth-control maneuvers under two display conditions. One display consisted of conventional depth-control instruments; the second display was identical except for the addition of a pitch-rate indicator. The operators performed two types of tasks: (a) changing depth 200 ft up or down (depth seeking); and (b) maintaining a constant depth while counteracting a cyclic forcing function (depth keeping). The maneuvers consisted of simulated depth changes only; no changes in heading were involved. Each operator performed ten trials under each display-task condition over a five-day period. An analysis of the graphic records indicated that the inclusion of a pitch-rate indicator did not significantly improve depth-keeping performance. In the case of depth seeking, however, the results were equivocal. Performance with the pitch-rate indicator was better in some cases; not significantly different in others. (Author)

AD-258 752 Div. 31, 9
(29 June 61) OTS price $7.60

St. Anthony Falls Hydraulic Lab., U. of Minn., Minneapolis.
AN EXPERIMENTAL STUDY OF FLEXIBLE FLOATING BREAKWATERS,
by John F. Ripken. Oct 60, 72p. incl. illus. table (Technical paper no. 31, Series B)
(Contract NBy-3143)

Unclassified report

DESCRIPTORS: *Breakwaters, Floating bodies, Model tests, Ocean waves, Water waves, Test facilities, Attenuation, Harbors, Mooring, Tests, Model basins, Containers, Design, Configuration, Hydrodynamics, Floats.

Earlier studies had indicated that moored flexible bags positioned slightly below the water surface and filled with a liquid or a gas could attenuate the height of gravity water waves. Studies are described of large and small scale laboratory tests to evaluate the attenuation effects and mooring forces for various bag configurations. A breakwater composed of a moored row of lean, floating cylindrical bags filled with water provided excellent wave attenuation with moderate mooring forces. This type of breakwater appeared suitable for practical development or temporary wave protection works. Submerged bags filled with air also provide good attenuation action but involved a substantial structural system for mooring. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-258 643 Div. 32
(28 June 61) OTS price $.50

Belfour Engineering Co., Suttons Bay, Mich.
CONSIDERATIONS AND RECOMMENDATIONS FOR DEVELOPING A MATERIALS INFORMATION PROCESSING CAPABILITY,
by Albert J. Belfour. Rept. for Feb-Nov 60 on Materials Application. Feb 61, 13p. incl. illus. 45 refs.
(Contract AF 33(616)7064, Proj. 7381)
(WADD TR 60-867)

Unclassified report

DESCRIPTORS: *Documentation, Library science, Scientific reports, *Data processing systems, *Materials, Analysis, Design, Processing.

A survey is summarized in conjunction with recommendations for the development of a Materials Information Processing Capability at the WADD Materials Central. The discussion covers some basic concepts of technical information, user requirements, and existing information centers. A consistency in pattern of information processing techniques is examined and discussed. Recommendations are given for the development of a Materials Information Processing Capability. (Author)

AD-258 836 Div. 32
(29 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE DISTRIBUTION OF THE POPULATION OF THE USSR BY SOCIAL GROUPS, BRANCHES OF THE PUBLIC ECONOMY, AND OCCUPATIONS, AND ABOUT THE LEVEL OF EDUCATION OF PERSONS ENGAGED IN PHYSICAL AND INTELLECTUAL WORK.
20 Mar 61, 29p. (Trans. no. MCL-843 of Vestnik Statistiki 12:3-21, 1960)

Unclassified report

DESCRIPTORS: *Population, *USSR, Economics, Labor, *Sociology, Social sciences, Education, Distribution.

Division 33 - TRANSPORTATION

33. TRANSPORTATION

AD-258 478 Div. 33
(21 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINING THE LENGTH OF RUNWAYS,
by Zdenek Wencl. 2 Mar 61, 13p. incl. illus. table (Trans. no. MCL-749 of Letecky Obzor 4:pp. 204-206, 1960)

Unclassified report

DESCRIPTORS: *Runways, Landing, Landing fields, Specifications, USSR, Mathematical analysis.

AD-258 484 Div. 33, 1, 10
(21 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AVIATION REVIEW (SELECTED ARTICLES).
16 Feb 61, 30p. incl. illus. table (Trans. no. MCL-777 of Letecky Obzor 6:pp. 170-172, 180-181, 182-186, 1960)

Unclassified report

DESCRIPTORS: Atmosphere, *Gases, Rocket fuels, Jet engine fuels, *Rockets, Jet engines, USSR, Airports, *Air transportation.

Contents:
Atomic gases, by A. Silenkov
Mechanization of Soviet Airfields, by N. Klavin
Fueling of Aircraft, by Milan Ogoun

AD-258 562 Div. 33, 4
(27 June 61) OTS price $11.50

Little, Arthur D., Inc., Cambridge, Mass.
HANDBOOK FOR HYDROGEN HANDLING EQUIPMENT. SUPPLEMENT NUMBER 1,
by A. W. Adkins, I. A. Black and others. May 61, 144p. incl. illus. tables.
(Contract AF 33(616)7330, Proj. 0(1-8119))
(Supplement no. 1 to WADC TR 59-751)

Unclassified report

DESCRIPTORS: *Handbooks, *Handling, *Hydrogen, Safety, *Gas cylinders, Reliability, Design, Specifications, Pumps, Economics *Gas pumps, *Vacuum bottles, Pipe fittings, *Vacuum pumps, *Liquefied gases.

Section I establishes the current availability and specifications for liquid hydrogen pumps and cites the operational experience reported by the major users of these items. Section II sets forths a tested method for predicting the hydrogen gas required for the pressurized transfer of liquid hydrogen. Section III recounts the known facts relating to the safety and reliability of hydrogen gas cylinders as used in typical operations for the pressurized transfer of liquid hydrogen. Section IV presents the design specifications and performance characteristics of gravity-fed and boosted pressure-fed vaporizers for liquid hydrogen transfers established as a result of an integrated program of theoretical analysis and tests. Section V includes an economic comparison of systems using pumps, hydrogen vaporizers and high-pressure hydrogen gas bottles to transfer liquid hydrogen. Section VI presents the results of a further investigation of the single parting line coupling for vacuum-jacketed transfer lines originally reported in WADC TR-59-386. A modified design and its performance characteristics established from tests are included. (Author)

AD-258 819 Div. 33, 1
(29 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE GROWTH OF SPEED IN AIR TRANSPORT,
by I. Obruckij. 2 Mar 61, 7p. incl. illus.
(Trans. no. MCL-747 of Letecky Obzor 4:66-67, 1960).

Unclassified report

DESCRIPTORS: Transport planes, *Air transportation, USSR, Technological intelligence, *Air speed, *Economics, Jet planes, *Flight speeds.

Passenger air transporation will increase about sixfold during the current Seven Year Plan, 1959-1965. The main advantage of air transportation is the high speed. This is not the technical speed of the aircraft, but the transportation speed or flight time. Time saved with higher speeds grows with the distance traveled and is dependent on the number and duration of stops on the route. Long distance flights with only one stop can increase payload capacity and decrease direct transportation cost. Short distance flights on local routes are mainly in areas lacking roads, where the airplane is the only mechanical means of transportation. There, it is very important for social-political and economic reasons. Where train and auto transportation are available, the value of short distance flights is dependent on fight frequency.

AD-259 015 Div. 33
(6 July 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF CANADA-STANDARDIZED TRAIL TYPE METAL SNOWSHOES.
22 May 61, 6p. (Proj. no. ATB 3-211)

Unclassified report

DESCRIPTORS: *Snowshoes, Metals, Tests, Arctic regions, Magnesium, Steel wire, Canada.

The test snowshoes consist of a magnesium frame with center section made of galvanized steel wire having seven strands, each strand having seven wires. The wire in the toe and tail section is the same type as the center with the exception that it has three strands, each having seven wires. All wires are covered with nylon plastic coating. The over-all length of the test snowshoes is 47-1/2 inches. The width is 12-3/4 inches. Test and control snowshoes were cold-soaked for 72 hours at ambient temperatures ranging from -11 F to -44 F prior to testing. Ambient temperatures during the test ranged from 42 F to -47 F The snowshoes were satisfactory with respect to weight, ease of affixing, adjustment for proper fit, mounting and dismounting of the bindings, aerial delivery, maintenance, field repair and durability. The test snowshoes were superior to the control snowshoes with respect to shorter length, lighter weight, maneuvering in wooded areas, traveling over packed trails, ease of mounting and dismounting with modified test bindings, ease of maintenance and field repair; and inferior with respect to slippage, trail breaking, and lateral control. (Author)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk will be included in the cumulative indexes.

BIBLIOGRAPHY

BMI-1514(Del.) $2.00

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING APRIL, 1961, by R. W. Dayton and C. R. Tipton, Jr. Rept. on Contract W-7405-eng-92. 1 May 61, 94p.

PB 171 907 $1.25

Naval Research Lab., Washington, D. C.
BIBLIOGRAPHY OF UNCLASSIFIED NRL FORMAL REPORTS NUMBERS 5000 TO 5500. May 61, 47p. 586 refs. NRL Rept. 5500B.

DESCRIPTORS: Naval research, *Scientific reports, Bibliography, Reports.

Section 2 is an alphabetical author index of reports 1000 to 5500 and Section 3 is an alphabetical listing of series titles. This report should be used with NRL Report 5000B, Bibliography of Unclassified Formal Reports numbers 1000 to 5000. A subject index is not contemplated. (Author)

SCR-255 $2.50

Sandia Corp., Albuquerque, N. Mex.
CIVILIAN APPLICATION RELEASES THROUGH 1960. Jan 61, 118p.

ASTRONOMY

Astrophysics

BNL-658 $0.50

Brookhaven National Lab., Upton, N. Y.
RADIOASTRONOMY AND COMMUNICATION THROUGH SPACE, by E. Purcell. Brookhaven lecture series no. 1, 16 Nov 60. June 61, 13p.

PB 155 299 $3.60

Stanford Electronics Labs., Stanford U., Calif.
STANFORD MICROWAVE SPECTROHELIOGRAMS FOR 1960 MAY, by G. Swarup. Scientific rept. no. 10 on Contract AF 18(603)53. 15 Jan 61, 35p. 2 refs. Stanford Radio Astronomy Inst. pub. no. 10; AFOSR-264; AD-252 914.

DESCRIPTORS: *Sun, Solar atmosphere, *Solar energy, Radiofrequency, Mapping, *Radio waves, Spectrographic analysis, Superhigh frequency.

(See also PB 154 130)

PB 155 822 $8.60

Stanford Electronics Labs., Stanford U., Calif.
TRANSMISSION SYSTEM OF THE MICROWAVE SPECTROHELIOGRAPH, by K. S. Yang. Scientific rept. no. 14 on Contract AF 18(603)53. 20 Mar 61, 97p. 31 refs. AFOSR-481; AD-254 800.

DESCRIPTORS: *Sun, *Transmission lines, Waveguides, Phase shifters, Radio waves, Solar atmosphere, Radiofrequency, Broadband.

The Microwave Spectroheliograph is an instrument for obtaining pictures of monochromatic electromagnetic radiation of the sun. Operating at 9.1 cm, it provides a family of pencil beams of 2.3 minutes of arc for scanning the solar disk in a television-like fashion. The aerial system consists of thirty two 10-foot paraboloidal reflectors, arranged in the form of a cross. The transmission system provides the microwave link between the reflector feed-horns and the input to the receiver. A rectangular S-band copper waveguide constitutes the bulk of the transmission system. The waveguide is arranged in a branched system which permits equal electrical path length from all aerials to the receiver, thus offering superior phase stability and wider operating-frequency band. The techniques for measurement and adjustment of amplitude and phase of each aerial are described. A newly developed scheme of phase measurement is given for rapid comparison of aerials thousands of wavelengths apart by using modulated gas discharge tubes. Attention is given to choice of broadband components for the entire transmission system. Final evaluation of the transmission line system is made through actual observations of the sun.

BEHAVIORAL SCIENCES

Personnel and Training

PB 155 174 $4.60

Arctic Aeromedical Lab. [Fort Wainwright] Alaska.
CONSTRUCTION AND VALIDATION OF A TEST BATTERY AS DETERMINANT OF OVERSEAS ADJUSTMENT POTENTIAL. VALIDATION OF A BIOGRAPHICAL INVENTORY TO SELECT AIRMEN WHO DESIRE TO EXTEND THEIR ALASKAN DUTY TOUR, by Frederick H. Rohles, Jr. Nov 53, declassified. 47p. 4 refs. Proj. no. 22-0201-0002, research rept. no. 1, series 2; Public rept. 47.

DESCRIPTORS: *Aviation personnel, Selection, Test methods, Personnel adjustment (Psychology), Alaska

A biographical inventory was constructed and administered to 701 airmen in the Alaskan Air Command and the individual items were validated against the criterion of duty tour extension status. Two keys were developed and cross-validated which yielded validity coefficients of .469 and .543. While this inventory is only one tool for aiding in the selection of personnel for Alaskan duty, it serves as a guide for the development and validation of additional selection devices.

PB 156 732 $4.60

Purdue U. [Lafayette, Ind.]
THE MATHEMATICS OF PERSONNEL UTILIZATION MODELS, by Carl F. Kossack and Richard E. Beckwith. Rept. on Contract AF 41(657)160. Nov 59, 43p. 16 refs. WADC Technical rept. 59-359; AD-233 775.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Personnel, Aviation personnel, Mathematical analysis, *Programming, *Mathematics, Training, Classification, Selection.

The development of a personnel utilization model was undertaken, with special attention to the problem of estimating cost to the Air Force resulting from varied policies governing selection, classification, and training of personnel. An actual model is constructed, including definitions, flow diagrams, and an illustration showing application of the model to the problem of personnel distribution for airmen during their first four years of service. A further development presents a specialization of the general model, using the mathematics of Markovian processes. The authors conclude that the Air Force would benefit from evolving a model of its personnel program not only by thus solving heretofore unresolved model problems, but also by the examination of Air Force operations essential to development of the model and the identification of areas in which personnel research is likely to be most productive. (Author)

Psychology

PB 150 464 $5.60

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE COMBINING OF CLASSES CONDITION IN LEARNING THEORY, by Julian H. Blau (Antioch Coll.). Technical rept. no. 32 on Contract Nonr-225(17). 23 Aug 60, 52p. 13 refs. AD-242 478.

DESCRIPTORS: *Learning, Theory, Probability, *Reaction (Psychology), *Conditioned reflex, Transformations (Mathematics), Sampling, Statistical functions.

The Bush-Mosteller Combining of Classes Condition is extended to the case of a continuum of responses and also to a new context in stimulus sampling theory, where it has not been considered before. In the first case the Suppes linear model is obtained. In the second, the result yields a generalization of the Estes-Suppes conditioning transformation. While the first investigation concerns probabilities, and the second is entirely nonnumerical, they have interesting similarities. (Author)

PB 156 750 $1.60

Kresge Eye Inst., Detroit, Mich.
AN ANALYSIS OF CERTAIN FACTORS INVOLVED IN THE LEARNING PROCESS OF DYNAMIC VISUAL ACUITY FOR 1000 NAVAL CADETS, by James W. Miller and Elek Ludvigh. Rept. on Contract Nonr-586(00). 15 Apr 57, 12p. 8 refs. Joint Proj. NM 17 01 99 Subtask 2, rept. 13.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Visual acuity, Visual thresholds, Learning, Target recognition, Statistical analysis, Tests, Training.

The purpose of the present study was to examine certain aspects of the learning process of dynamic visual acuity for a group of 1000 subjects. The assumption was made that the rate of reduction of the acuity threshold with increasing practice is proportional to the difference between the present and "ultimate" threshold. The target velocities employed were 20^{o}/sec and 110^{o}/sec and the illumination used was forty footcandles. Comparisons were made between the total 1000 subjects, the 100 best and the 100 poorest terminal performers. (Author)

PB 156 749 $1.60

Kresge Eye Inst., Detroit, Mich.
DYNAMIC VISUAL ACUITY IN AN APPLIED SETTING by James E. Goodson and James W. Miller. 25 May 59, 17p. 6 refs. Joint Research Proj. NM 17 01 99 Subtask 2, rept. no. 16

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Visual acuity, *Visual perception, Targets, Motion, Target recognition, Naval aviation, Optical tracking, Flight testing, Perception

A Navy AD-5 (attack bomber) was used to fly subjects over targets (Landolt C's) at angular velocities decelerating from 20, 75, and 110 degrees per second. The dynamic acuity of each subject was then tested in the laboratory using constant angular velocities comparable to those above. Exposure times in the air were the same as those in the laboratory. The results of these tests are compared and implications of the relationships are discussed. (Author)

PB 156 756 $1.60

Kresge Eye Inst., Detroit, Mich.
THE MEASUREMENT OF DYNAMIC VISUAL ACUITY WHILE THE OBSERVER IS ROTATING, by James W. Miller. Rept. on Contract Nonr-586(00). 10 Sep 56, 15p. 16 refs. Joint Proj. rept. no. NM 001 110 501, rept. no. 11.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Visual acuity, *Visual perception, *Target recognition, Test methods, *Rotation, Eye, Visual thresholds, Statistical analysis, Perception.

The dynamic visual acuity of six subjects was tested during rotation at various constant angular velocities. These results were compared with those obtained previously at which time the subjects remained stationary and the test objects were moved. It was found that visual acuity deteriorates in much the same fashion with an increase in the relative angular velocity of the target, regardless of whether it is the observer or the target which is moved. (Author)

PB 156 751 $1.60

Kresge Eye Inst., Detroit, Mich.
THE RESULTS OF TESTING THE DYNAMIC VISUAL ACUITY OF 1000 NAVAL AVIATION CADETS, by James W. Miller and Elek Ludvigh. Rept. on Contract Nonr-586(00). 10 Aug 56, 18p. 13 refs. Joint Proj. NM 001 110 501, rept. no. 10.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Visual acuity, *Visual perception, Naval aviation, Vision, Statistical analysis, Visual thresholds, *Target recognition, Group dynamics, Perception.

It had been previously shown that visual acuity deteriorates as the angular velocity of the test object relative to the observer's eye, is increased. The results of testing the dynamic visual acuity of 1000 naval aviation cadets are presented and some aspects of the data are analyzed. It is found that the parameters employed to describe dynamic vision are not distributed normally. Some possible causes for this non-normality are considered. It is demonstrated that it is possible to place individuals into statistically distinguishable categories on the basis of their dynamic visual acuity. The possible application of this with regard to the future selection of pilots is considered. (Author)

PB 156 752 $2.60

Kresge Eye Inst., Detroit, Mich.
TIME REQUIRED FOR DETECTION OF STATIONARY AND MOVING OBJECTS AS A FUNCTION OF SIZE IN HOMOGENEOUS AND PARTIALLY STRUCTURED VISUAL FIELDS, by James W. Miller and Elek J. Ludvigh. Rept. on Contract Nonr-586(00). 26 May 59, 21p. 13 refs. Joint Research Proj. NM 17 01 99 Subtask 2, rept. no. 15; AD-225 723.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Visual perception, *Target recognition, Detection, Motion, Psychology, Vision, Targets, Statistical analysis.

An investigation was made of the detection of stationary and moving objects in a homogeneous visual field. It was found, as expected, that the larger the objects the sooner they were detected. It was shown, however, that objects over six times threshold size required an average of 20 to 30 seconds to locate. It is assumed that search is carried out in a series of discrete acts but that the total absence of visible detail prevents any systematic procedure from operating efficiently. The gross inefficiency of search is said to be the cause of the long acquisition times found. Probability functions were found to corroborate this hypothesis in that the experimental data did not fit the hypothesis incorporating the assumption of a systematic search. (Author)

PB 156 755 $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
OCULAR PURSUIT OF A TARGET MOVING IN AN APPARENT CIRCULAR PATH, by Earl F. Miller, II. 4 Sep 56, 23p. 7 refs. Proj. no. NM 001 110 102, rept. no. 1.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Visual acuity, *Visual perception, *Target recognition, Test methods, Eye, *Rotation, Visual thresholds, Statistical analysis, Perception.

Dynamic visual acuity tested with a rotary prism was compared with that measured with a rotating mirror apparatus. The abnormally distributed rotary prism thresholds were relatively higher than, yet correlated significantly with, those of the rotating mirror. The relative increase found with the prism in the rate of deterioration of acuity with an increase in angular velocity was attributed to the exclusive factor of rate of repeated rotation of the eye. (Author)

PB 150 168 $8.10

Rutgers State U., Brunswick, N. J.
HOMEOSTASIS THEORY OF SMALL GROUPS V: CASE STUDY, by F. K. Berrien and William H. Angoff. Technical rept. no. 7 on Contract Nonr-404(10). Aug 60, 87p. 1 ref. AD-243 083.

DESCRIPTORS: *Group dynamics, Theory, Attitudes, Leadership, Behavior, Needs, Industry, Personnel, Labor.

Direct observation of two work groups doing identical work are reported in an effort to test the hypothesis that groups high in Group Need Satisfactions (G.N.S.) and Formal Achievement (F.A.) also adapt easily to disturbances arising in the environment in which the group is embedded. One group, the day shift, showed low levels in both G.N.S. and F.A. and furthermore was frequently disturbed by minor changes such as a delay in the delivery of materials, or the absence of one man, or a slight modification in the manner of doing a task. The second group, the night shift in the same work area, had nearly twice the F.A. of the day shift and showed less interpersonal hostility. This group also displayed a greater ease in absorbing disturbances and changes in routines. The major hypothesis of the study is therefore confirmed. The report also contains interpretations and hypotheses to account for the failure of attitude survey data to support earlier hypotheses generated out of a general theory of groups making central use of the homeostasis concept. (Author) (See also PB 152 889)

PB 156 753 $1.60

Tulane U., New Orleans, La.
ABSOLUTE THRESHOLDS OF PERCEPTION OF DIRECTION OF ANGULAR ACCELERATION, by Cecil W. Mann and John Ray. Rept. on Contract Nonr-475-05 25 May 56, 18p. 8 refs. Joint Proj. NM 001 110 500, rept. no. 41.

This report released for sale to the public 21 July 61.

DESCRIPTORS: Adjustment (Psychology), *Acceleration, Perception, Reaction time, Positioning reactions, Ear, Tests, Statistical analysis, *Rotation.

The threshold of perception of angular acceleration was defined in this experiment in terms of a component of angular acceleration applied for a given time of exposure and judged correctly as to direction at a 75 per cent level of confidence. The results indicate that the curve of best fit describes a hyperbolic relationship between acceleration and exposure time. The maximum time of exposure of 30 seconds was determined by previous experiments on adaptation, and at this maximum the defined angular threshold acceleration was of the order of $0.035^{o}/sec^{2}$. (Author)

PB 156 754 $1.60

Tulane U., New Orleans, La.
THE PERCEPTION OF THE VERTICAL. XIV: THE EFFECT OF RATE OF MOVEMENT ON THE JUDGEMENT OF THE VERTICAL, by Cecil W. Mann and James T. Ray. Rept. on Contract Nonr-475-05. 22 May 56, 14p. 1 ref. Joint Proj. NM 001 110 500, rept. no. 40.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Vertical perception, Tests, Motion, Analysis of variance, Adjustment (Psychology), Positioning reactions, *Rotation, Perception.

An experiment was designed to test the effect of different rates of tilting movement upon the judgment of the postural vertical in the absence of visual cues. Subjects were tilted at combinations of speeds, delay at the tilted position, and in right and left quadrants. Analysis of variance of the constant errors indicates that the errors of judgment are significantly greater when the subjects are returned to the vertical at slower rates of movement. It is suggested that the problem of differential adaptation to inclination as an influence upon vertical judgment should be examined in the airplane under conditions of relatively rapid and relatively slow return from a bank to a straight and level attitude. (Author)

BIOLOGICAL SCIENCES

OTS SB-446 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
BIOLOGICAL SCIENCES. May 61, 8p. 88 refs. OTS Selective Bibliography SB-446.

DESCRIPTORS: Bibliography, *Biology, Biochemistry, Physiology, Radiobiology, Scientific reports, *Medicine, Translations.

A bibliography of reports and translations available in paper copy from OTS and representative of those released by OTS during the period of January to April 1961. Subjects included in this bibliography are: Biology, Botany, Ornithology, Zoology, Drugs, Diseases, Toxicology and Medical Procedures.

PB 155 642 $3.60

Queen's U., Belfast (Northern Ireland).
KINETICS AND MECHANISMS OF TRIPSIN- AND THROMBIN-CATALYSED AND RELATED REACTIONS, by D. T. Elmore, N. J. Baines, and E. F. Curragh. Final technical rept. no. 1, 15 Oct 59-28 Feb 61, on Contract DA 91-591-EUC-1301, [1961] 32p. 61 refs. AD-254 529.

DESCRIPTORS: *Trypsin, Biochemistry, *Thrombin, Chemical reactions, *Catalysis, *Enzymes, Theory, Esters, Amides, Ions, Hydrolysis, Proteins, Temperature, Ionization.

In aqueous solution at slightly alkaline pH values, the methyl esters of N-alpha-toluene-p-sulphonyl-DL-ornithine (TOME) and gamma-amino-alpha-toluene-p-sulphonamido butyric acid (ATBME) undergo rapid lactamisation to the virtual exclusion of hydrolysis. The kinetics of those reactions have been studied over a range of pH values and temperatures. The results are consistent with a mechanism involving hydroxyl ion catalysis. TOME is slowly hydrolysed by trypsin, but ATBME is unaffected by the enzyme. The methyl ester of N-alpha-toluene-p-sulphonyl-L-lysine (TLME), which has a longer side-chain, is a good substrate for trypsin, although detailed kinetic studies are not complete. Extensive studies of the kinetics of trypsin-catalysed hydrolysis of the methyl ester of N-alpha-toluene-p-sulphonyl-L-arginine (TAME) and -L-homoarginine (THAME) has revealed that the former with its shorter side-chain is the better substrate. The Briggs-Haldane modification of the Michaelis-Menten equation v equals $k_3(E)(S) / (KM + (S))$ is obeyed. Using substrate levels high enough to ensure zero-order kinetics, k_3 has been determined at various temperatures. (Author)

PB 156 766 $1.60

School of Aviation Medicine [Brooks AFB] Tex.
A BIBLIOGRAPHY OF AVIATION DENTISTRY, by David F. Mitchell. 8 Apr 46, 13p. 109 refs. Proj. no. 391, rept. no. 2; AD-135 024.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Aviation medicine, *Dentistry, Bibliography, Medicine

A bibliography of the literature on Aviation Dentistry has been made in the form of an authors index, and a general subject index. The latter has been limited to four main headings. This bibliography replaces Project No. 391, Report No. 1. Some of the references have been changed or excluded, and many new references have been added. (Author)

Anatomy and Physiology

PB 156 767 $1.60

School of Aviation Medicine [Brooks AFB] Tex.
A COMPARISON OF CRASH INJURIES IN MAN AND LABORATORY ANIMALS, by Robert F. Rushmer and George M. Hass. 25 Mar 46, 17p. 7 refs. Proj. no. 471, rept. no. 1; AD-135 542.

This report released for sale to the public 20 July 61.

DESCRIPTORS: Aviation accidents, *Aviation injuries, Analysis, Injuries, Accidents, Deceleration.

The types of lesions in the lungs, liver, spleen, diaphragm, kidneys, gastrointestinal tract, and pancreas were similar in man and laboratory animal. The incidence and severity of the lesions were considerably greater in the human cases who died instantly. Extensive trauma to the brain, heart, and great vessels were not observed in the experimental animals.

PB 156 768 $1.10

School of Aviation Medicine [Brooks AFB] Tex.
ROENTGENOGRAPHIC STUDIES OF GASTROINTESTINAL MOTILITY OBSERVED IN SWING TEST SUBJECTS, by Francis E. McDonough. 15 July 43, declassified 15 Aug 45. 8p. Proj. no. 102, rept. no. 2; AD-236-414.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Digestive system, Physiology, *Motion sickness, Test methods, X-rays.

The presence of pylorospasm either before or after the swing test, or changes in pylorospasm during the swing test, occurred with almost equal frequency in the subjects tested regardless of whether they were "swing-sick" or "swing-immune." No change in the progress of the barium meal occurred in subjects who become "sick" during the swing test that did not also occur with equal frequency in those subjects who were "immune" to the swing test. In approximately one-half of all the subjects tested, an absence of barium in the duodenum and proximal jejunum after swinging was noted. This has been labelled the "interval pattern." Nothing in the roentgenologic appearance of the stomach before swing testing was found to correlate with whether the subject became "swingsick" or not.

PB 155 181 $5.60

Technische Hochschule, Munich (West Germany).
INVESTIGATION OF THE POSSIBLE INFLUENCE OF ATMOSPHERIC IONS ON HUMAN REACTION TIME, by Joseph Eichmeier. Final technical rept. 1 Feb 60-31 Jan 61, on Contract DA 91-591-EUC-1390. 28 Feb 61, 53p. 16 refs. AD-253 010.

DESCRIPTORS: *Atmosphere, Ionization, *Electroencephalography, *Respiration, *Blood circulation, *Reaction time, Statistical analysis. Density, *Ions, *Visual perception, Measurement, Test methods, *Electric fields, *Atmospheric electricity.

Experimental results concerning the effect of artificially-generated positive atmospheric ions of human alpha-rhythm, respiration frequency and pulse rate, are described. The statistical tests indicated that in more than half of 12 subjects investigated the respiration frequency showed a statistically-significant decrease of about 12% on the average, if artificially-generated positive atmospheric ions of high density were inhaled through the mouth by the subjects. A weak, but statistically-significant effect of positive atmospheric ions on alpha-frequency was found in one third of all subjects investigated. In a second experimental series the pulse rate and the average alpha-amplitude were recorded simultaneously with the alpha- and respiration frequency. The results of these experiments did not contradict those of the first experimental series. Natural ion concentrations were found to have an effect on the reaction time. An electronic device was developed for the measurement of the optical moment. Experiments concerning the effect of artificially-generated atmospheric ions on the optical moment showed that no effect attributable to the ions on the optical moment was observable. Improvements of the portable small-ion counter are described. (Author)

Pathology

PB 155 115 $1.60

Edinburgh U. (Gt. Brit.)
POST-OPERATIVE METABOLIC RESPONSE. Final technical rept. 1 Nov 59-30 Oct 60, on Contract DA 91-591-EUC-1315. [1960] 13p. 11 refs. AD-252 639.

DESCRIPTORS: *Water, *Metabolism, *Kidneys, *Electrolytes (Physiology), Excretion, Parathormone, Diuretics, Diabetes, Surgery, Hypothalamus, Pathology Corticosteroids, Histological sections, Surgical trauma.

Animal experiments have been continued. Rats, adrenalectomised, and maintained on cortisone gave unexpected metabolic results both before and after the adrenalectomy as well as after the subsequent bone fracture - nitrogen and potassium, as well as sodium were temporarily retained. Measurement of the rate of hydrocortisone production in man using an isotope dilution technique has shown, after surgical operation, a much greater increase in hormone production than was indicated by measurement of adrenocorticoid excretion. Renal biopsy material from 68 further patients suffering from renal disease has been studied along with clinical and biochemical examination of the same patients. This is a long-term project and though it is beginning to be possible to discern patterns, the position is not yet clear enough for discussion to be profitable. (Author)

PB 154 900 $1.60

[Vienna U. (Austria)].
INVESTIGATIONS ON SPRING-SUMMER-MENINGOENCEPHALITIS IN THE EASTERN PART OF AUSTRIA, by Hans Moritsch. Final technical rept. 1 Feb 60-31 Jan 61, on Contract DA 91-591-EUC-1379. [1961] 16p; AD-251 766.

DESCRIPTORS: *Encephalitis, Poliomyelitis, Nervous system, *Diseases, Epidemiology, Austria, Medical examination, Serum, *Brain, Analysis, Ticks, Disease carriers, Etiology, Diagnosis, Meningitis.

The final results are presented of virological-serological examinations with patients hospitalized at Neunkirchen with diseases of the central nervous system. The distribution of spring-summer-meningoencephalitis was analyzed and immunological tests were conducted. The part played by ticks in distributing the disease will be investigated.

Pharmacology and Toxicology

PB 154 205 $1.10

Columbia U. Coll. of Physicians and Surgeons, New York.
MODE OF ACTION AND PHYSIOLOGICAL EFFECTS OF INTRAVENOUS ANESTHETICS, by Lester C. Mark. Final rept. 15 June 55-31 Dec 59, on Contract DA 49-007-md-629. 8p; AD-230 737.

DESCRIPTORS: *Anesthetics, *Barbiturates, Physiology, Metabolism, Drugs, *Brain, Toxicity, Spinal cord, Butazolidines.

Thiobarbiturates pass into brain more rapidly than do their less fat soluble oxygen analogs. Barbital passes slowly into brain and still more slowly into cerebrospinal fluid. Electroencephalographic studies confirm the clinical finding that plasma level of thiopental is not the sole determinant of depth of anesthesia. Acute tolerance may play a role. Despite disadvantages of side effects of methohexital and of poor solubility of non-barbiturate G29505, both of these drugs are potentially useful intravenous anesthetics. The findings of ataralgesia (analgesia and ataraxy) reported by Hayward-Butt using Demerol, Daptazole and Pacatal was not confirmed. The sulfoxide metabolite of a butazalodine derivative which markedly enhances renal excretion of enolic acids did not hasten the recovery of dogs from barbital anesthesia. The analeptic methylphenidate (Ritalin) and two N-allyl barbiturates all failed to antagonize deep thiopenta l anesthesia. (Author)

PB 155 525 $2.60

Istituto Superiore di Sanita (Italy).
EFFECT OF MEPHENESIN ON THE REPETITIVE DISCHARGE OF SPINAL CORD INTERNEURONS, by V. G. Longo. Final rept. pt. 2 on Contract AF 61(052)188. 1 Dec 60, 24p. 17 refs. AFOSR-234; AD-251 239, pt. 2.

DESCRIPTORS: *Spinal cord, *Convulsions, *Nerves, *Drugs, Inhibition, Strychnine, Electrical properties, Biochemistry, *Muscles, *Brain, Test methods, Pharmacology, Thebaines, Toxicity.

The results obtained during studies of the influence of Mephenesin on the electrical activity of single spinal interneurones, registered by means of microelectrodes are also presented. In about 50% of the units, a diminution of both the spontaneous and the evoked firing was observed after 20 to 40 mg/kg of the drug. The results obtained were compatible with the hypothesis of a depression by mephenesin on the activity of some interneurones. (Author)

PB 155 524 $1.60

Istituto Superiore di Sanita (Italy).
SPINAL MECHANISMS INVOLVED IN THE CONVULSANT ACTION OF 5-7-DIPHENYL-1-3-DIAZADAMANTAN-6-OL (1757 I. S.) by Vincenzo G. Longo. Technical final rept. pt. 1 on Contract AF 61(052)188. 1 Dec 60, 19p. 16 refs. AFSOR-233; AD-251 239, pt. 1.

DESCRIPTORS: *Spinal cord, *Convulsions, *Nerves, *Drugs, Inhibition, Strychnine, Electrical properties, Biochemistry, *Muscles, *Brain, Test methods, Pharmacology, Thebaines, Toxicity.

The effects in spinal anesthetized cats of 5-7-diphenyl-1-3-diazadamantan-6-ol (1757 I. S.) on mono and polysynaptic reflexes on spinal inhibition are described. These results combined with earlier data obtained in this laboratory strongly suggest that the principal action of 1757 I. S. is to abolish spinal inhibition, and indicate a close similarity between this agent and strychnine. (Author)

Radiobiology

TID-12616 $0.75

Atomic Energy Commission. Div. of Biology and Medicine, Washington, D. C.
ATMOSPHERIC RADIOACTIVITY AND FALLOUT RESEARCH. Apr 61, 76p.

PB 149 861 $1.10

Emory U. School of Medicine, Ga.
FINAL REPORT, by Abner Golden. Rept. for Feb 52-June 60 on Contract Nonr-1386(02). 1960, 3p. 5 refs. AD-240 882.

DESCRIPTORS: Mammals; *Tissues (Biology), *Radiation effects, Histological sections, Radiobiology, *Radiation injuries, Determination, Alpha bombardment, Cosmic rays, Nuclei.

The effects of small doses of alpha radiation on mammalian tissues was studied in the hope that new data could be obtained concerning the mechanisms of cell injury produced by ionizing particles, and that the information obtained would be applicable to the study of tissue damage that might be produced at high altitude by cosmic heavy nuclei. Radiation injury can be detected within hours following exposure by the observation of nuclear vacuolization in tissues prepared by the freeze-dry method.

KY-371 $0.50

Union Carbide Nuclear Co., Paducah, Ky.
ENVIRONMENTAL MONITORING SUMMARY FOR THE PADUCAH PLANT FOR 1960, by E. G. Brown and R. C. Baker. Rept. on Contract W-7405-eng-26. 31 May 61, 15p.

NAA-SR-6131 $0.50

Atomics International, Canoga Park, Calif.
LAW OF CORRESPONDING STATES FOR FUSED SALTS, by H Reiss, S. W. Mayer, and J. Katz. Rept. on Contract AT(11-1)-GEN-8. 31 May 61, 21p.

Y-811 $1.00

Union Carbide Nuclear Co., Oak Ridge, Tenn.
ALKALI METALS AREA SAFETY GUIDE, by P. L. Hill. Supplemental issue. Rept. on Contract W-7405-eng-26. 15 May 61, 32p.

Analytical Chemistry

PB 155 454 $1.60

[Birmingham U. (Gt. Brit.)]
SUBMICRO METHODS FOR THE ANALYSIS OF ORGANIC COMPOUNDS: DETERMINATION OF HYDROGEN, CHLORINE, IODINE AND SULPHURE, by R. Belcher. Annual technical rept. Feb 60-Feb 61, on Contract DA 91-591-EUC-1266. 28 Feb 61, 13p. 9 refs. AD-253 369.

DESCRIPTORS: *Chemical analysis, *Microanalysis, Determination, *Hydrogen, *Organic compounds, Oxygen, Decomposition, *Chlorine, *Iodine, *Sulfur.

The following investigations were made: (1) The development of a method for the determination of hydrogen, the only common organic element for which a method is not available; and (2) An examination of the oxygen-flask decomposition procedure. The oxygen-flask decomposition procedure was used to develop simple and accurate methods of determining chlorine and sulfur. The determination of iodine by this means was not as accurate as the original sodium fusion procedure, but in view of its speed and simplicity it might be preferred in certain cases. (Author)

LA-2540 $0.50

Los Alamos Scientific Lab., N. Mex.
DETERMINATION OF IMPURITIES IN HELIUM, by G. E. Meadows, G. L. Hubbard, and H. M. Busey. Rept. on Contract W-7405-eng-36. 15 Apr 60, 23p.

NAS-NS-3101 $1.00

Oak Ridge National Lab., Tenn.
LIQUID-LIQUID EXTRACTION WITH HIGH-MOLECULAR-WEIGHT AMINES, by F. L. Moore, 15 Dec 60. 86p.

DP-566 $3.00

Savannah River Lab., Aiken, S. C.
RADIOCHEMICAL SEPARATIONS PLANT STUDY. PART II: DESIGN AND COST ESTIMATES, by W. H. Farrow, Jr. Rept. on Contract AT(07-2)-1. Mar 61, 395p.

Inorganic Chemistry

PB 171 910 $0.50

Indiana U., Bloomington.
SYNTHESIS OF POLYSILANES, by Riley Schaeffer, Louis Ross and others. Technical rept. no. 1, 1 July 59-30 June 60, on Contract Nonr-908(14). 15 July 60, 17p. 15 refs. AD-241 899.

DESCRIPTORS: *Silanes, Polymers, Synthesis, Chemical reactions, Chlorides, Hydrides, Amines, Arsenic compounds, Mass spectroscopy.

Derivatives of Disilane: Literature references are reviewed, with consideration being given to (1) thermal decomposition of $(SiH_2)_x$ prepared by the reaction of Ca-Si alloy with a solution of anhydrous hydrogen chloride dissolved in EtOH, (2) reduction of chlorinated derivatives of higher silanes by $LiAlH_4$, and preparation of 80% Si_2H_6 and 7% SiH_4. Mass spectra data on SiH_4, Si_2H_6, and Si_2H_5Cl are analyzed. Attempts are being made to prepare $N(Si_2H_5)_3$. Silyl Amines: Trisilylamine was prepared by reacting chlorosilane with ammonia. Silane and hydrogen chloride were reacted to yield monochlorosilane. Mass spectra data on $N(SiH_3)_3$ are given. Compounds of the Type M(III)-M'(V)S_4: As(III)As(V)S_4 was prepared, and its physical properties were studied. When heated on a metal block, the compound rapidly turns from yellow to deep red-orange at 180° and converts to a brown, gummy or tar-like substance at 220°. This substance does not become more fluid when heated as high as 300°. Upon cooling, the residue forms a very brittle, glossy, brown solid substance. A weighed sample held at 230° for 8 hr under vacuum left the same residue as when heated on the metal block and was found to have lost 4.6% of its original weight. X-ray diffraction powder patterns of the samples of As(III)As(V)S_4 showed them to be essentially amorphous.

PB 150 419 $1.60

Stauffer Chemical Co., Calif.
INORGANIC POLYMERS PROGRAM, by A. J. Leffler. Semi-annual technical rept. 1 Jan-1 July 60, on Contract Nonr-2259(00). 29 Aug 60, 11p. 1 ref. AD-242 418.

DESCRIPTORS: *Polymers, Diboranes, Nitriles, Halides, Boron compounds, Nitrogen compounds, Heterocyclic compounds, Solubility, Azoles, Polymerization.

Studies were made of the reactions of diborane dissolved in dimethoxyethane with perhalonitriles to yield compounds of the type $RCH = NBH_2$. When trichloroacetonitrile was used, an intermediate was formed which was isolated as a crystalline, sublimable solid. Upon heating in an inert atmosphere to avoid explosion, the intermediate was coverted to the trimeric borazine which precipitated upon cooling. The reaction of diborane with trifluoroacetonitrile produced, in addition to borazine, a low-melting solid polymer which could be drawn into filaments. The polymer was soluble in benzene and chloroform; its IR spectrum revealed N-H, C-H, B-H, C = N, and CH_2 groups. A band at 1160 cm^{-1} was thought to be caused by C-C stretching. It was concluded that the polymer had a linear structure but the

mechanism of its formation was not determined. The compound $[CCl_3CH_2NBH]_3$ is insoluble in H_2O and slightly in MeOH, benzene, and acetone. It is relatively inert to electrophilic substitution but is subject to nucleophilic attack. The fluorinated borazines are much less stable than the chlorinated analog. They easily undergo methanolysis, decompose slowly when allowed to stand in solution, and are soluble in benzene, CCl_4, and chloroform. (See also PB 148 594)

Organic Chemistry

PB 155 533 $3.60

Aerojet-[General] Corp., Azusa, Calif.
A REVIEW OF DINITROMETHANE AND 2,2-DINITROETHANOL, by L. Herzog and K. Klager. Rept. on Contract N7onr-462, T.O. 1. 20 July 50, declassified 1 Mar 61. 33p. 27 refs. Rept. no. 461 (Special).

DESCRIPTORS: Methanes, Nitro radicals, Ethanols, *Nitrogen compounds, *Explosives, *Propellants, Synthesis, Physical properties, Chemical reactions, Chemical properties.

PB 155 534 $7.60

Aerojet-[General] Corp., Azusa, Calif.
A REVIEW OF NITROFORM AND 2,2,2-TRINITROETHANOL, by Karl Klager and Milton B. Frankel. Rept. on Contract N7onr-462, T.O. 1. 13 Feb 51, declassified 1 Mar 61. 78p. 161 refs. Rept. no. 494 (Special).

DESCRIPTORS: Ethanols, Nitro radicals, Methanes, *Nitrogen compounds, *Explosives, *Propellants, Synthesis, Physical properties, Chemical reactions, Chemical properties.

PB 155 645 $1.60

Florida U. Engineering and Industrial Experiment Station, Gainesville.
FLUOROCARBON N-F COMPOUNDS, by J. A. Young and R. D. Dresdner. Quarterly technical rept. no. 7 on Contract DA 01-009-ORD-772. [1960] 17p. 4 refs. ARPA Order no. 40-59, Task no. 3; OOR proj. 007.

DESCRIPTORS: *Fluorocarbons, *Nitrogen compounds, Alkyl radicals, *Fluorides, Bromides, Amines, Mercury compounds, Hydrazines, Amides, Propenes, Imides, Isomers, Catalysts, Cesium compounds, Synthesis, Chemical reactions, Isomeric transitions, Pyrolysis, Azoles.

Perfluoropentadiene-1,4 failed to react with NF_3; however, this diene was isomerized by cesium fluoride, over a wide temperature range, to perfluoropentyne-2. A study was made of the isomerization of C_5F_8 isomers over selected catalysts. Both $CF_3CF{:}CF_2$ and $CF_3N{:}CF_2$ were found at least to dimerize over cesium fluoride. Definite indications of the successful synthesis of a fluorocarbon diacyldiimide, $CF_3CON{:}NCOCF_3$, have been obtained. Triamides containing fluorocarbon groups have been made by reaction between N-bromoimides and acyl halides, in yields ranging from very poor to good. The reaction between acyl halides and $((CF_3)_2N)_2Hg$, gives amides of the structure $RCON(CF_3)_2$ in good yield with all acyl halides except phosgene. Tetrakis-(trifluoroacetyl) hydrazine on heating to 300 degrees is converted to 3,5-bis (trifluoromethyl)oxadiazole, plus trifluoroacetic anhydride. (Author) (See also PB 154 251)

UCRL-9519 $1.50

Lawrence Radiation Lab., U. California, Berkeley.
BIO-ORGANIC CHEMISTRY. Quarterly rept. Sep-Nov 60, on Contract W-7405-eng-48. 31 Jan 61, 65p.

PB 154 899 $1.10

Manchester Coll. of Science and Tech. (Gt. Brit.)
CROSS LINKING OF LINEAR POLYMERS BY CONDENSATION REACTIONS. Annual rept. no. 1, 1 Oct 59-30 Sep 60, on Contract DA 91-591-EUC-1034. 30 Sep 60, 6p; AD-251 765.

DESCRIPTORS: *Polymers, *Polymerization, *Condensation reactions, Preparation, Methyl radicals, Acrylic resins, Styrenes, Theory, Infrared spectroscopy, Titration, Molecular weight, Chemical reactions, Measurement, Glycols.

A study is being made of the cross linking of simple linear polymer molecules, which are to be taken as a model for the cross linking of more complex polymers such as cellulose. The application of the classical theory of gelation to systems cross linked by a condensation reaction is being investigated, in order to find the proportion of cross links which are wasted intramolecularly. The methacrylic acid-styrene copolymer was prepared with 1% benzoyl peroxide as an initiator. The copolymer was cross linked by various glycols at 160 C with p-toluene sulfonic acid as esterification catalysts. The kinetics of the crosslinking reaction were studied by recording the disappearance of the acid group on the copolymer. Carboxyl groups were estimated by titration with sodium ethoxide solution in a benzene-ethanol mixture.

PB 156 263 $1.60

Massachusetts U., Amherst.
THE CALCULATION OF THE PRINCIPAL POLARIZABILITIES OF SOME CYCLOPARAFFINS, by Alphonse Plaza, Daniel A. Keedy, and Richard S. Stein. ONR Technical rept. no. 19 on Contract Nonr-2151(00). 1 July 60, 17p. 30 refs. Ad-247 751.

DESCRIPTORS: *Monocyclic compounds, Polarization, *Cyclobutanes, *Cyclopentanes, *Cyclohexanes, Mathematical analysis, *Chemical bonds*.

Values of principal polarizabilities and depolarizations for cyclopropane, cyclobutane, cyclopentane, and cyclohexane were calculated on the basis of both the Denbigh (Trans. Faraday Soc. 36:1940) and Bunn-Daubeny(Ibid., 50:1173, 1954) polarizability values. The Denbigh values lead to larger anisotropies and depolarizations that are 10 to 40 times those for the Bunn-Daubeny polarizabilities. The possible experimental precision should be adequate to determine which

agrees better and to establish whether there are unexpected effects arising because of the cyclic structure.

PB 152 217 $7.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
MODELS OF STEREOREGULAR POLYMERS (PART I); CHAIN ENTANGLEMENTS AND MECHANICAL PROPERTIES OF AMORPHOUS POLYMERIC SYSTEMS (PART II); ANIONIC POLYMERIZATION (PART III); [and] DIMENSIONS OF POLYMER CHAINS (PART IV) by R. D. Spencer, B. H. Beggs and others. Technical rept. no. 4, 1 Mar-31 Aug 60, on Contract Nonr-2693(00). 1960, 72p. 53 refs. AD-243 733.

DESCRIPTORS: *Polymers, *Polymerization, *Stereochemistry, Molecular structure, Mechanical properties, Copolymerization, Styrenes, Naphthalenes, Furan, Sodium compounds.

PB 152 012 $1.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
THE REACTION OF UREA WITH SOME AMINO-1,3,5-TRIAZINES, by F. L. Scott and H. Q. Smith. Technical rept. no. 17 on Contract Nonr-2687(00). Aug 60, 16p. 14 refs. AD-243 206.

DESCRIPTORS: *Triazines, Amines, Urea, Pyrolysis, Chemical reactions, Thiourea.

The copyrolysis of urea and melamine, or urea and benzoguanamine, at 180 (± 20)° for 40 minutes lead to the formation of 2-amino-4,6-diureido-1,3,5-triazine (IIb) and 2-phenyl-4,6-diureido-1,3,5-triazine (IId), with conversions of 62 and 35% respectively. When these condensations were performed under thermogravimetric analysis no unequivocal evidence for reaction was evident in the thermograms obtained. The conversions to IIb and IId were increased considerably when these condensations were run in dimethylformamide solution at 156° for six hours. Under these last conditions ammeline reacted poorly with urea to afford a low conversion (3%) to 2-hydroxy-4,6-diureido-1,3,5-triazine (IIg). Biuret was used successfully in place of urea in these reactions in DMF, and afforded conversion to IIb and IId of the appropriate substituted triazines of 79 and 38% respectively. When biuret was heated alone in DMF for six hours, a 35% conversion to cyanuric acid was obtained. Compound IIb reacted with formaldehyde under basic conditions to yield a compressible polymer, while IId failed under these conditions to undergo appreciable polymerization. (Author)

Physical Chemistry

PB 156 830 $1.60

Acoustics Research Lab., Harvard U., Cambridge.
DISSOCIATION AND VOLUME OF AN AQUEOUS BIVALENT SULFATE SOLUTION, by Frederick H. Fisher. Technical memo. no. 45 on Contract Nonr-1866(24). Aug 60, 15p. 12 refs. AD-249 535.

DESCRIPTORS: *Molecular association, Metallic compounds, *Sulfates, *Solutions, *Acoustics, Absorption, Theory, Mathematical analysis, *Ionization

An attempt has been made to determine quantitatively whether or not the dissociation reaction is responsible for the unusually high acoustic absorption exhibited by aqueous solutions of bivalent sulfates. To do so requires knowledge of the rate of change of volume of a solution with respect to degree of advancement of the chemical reaction. An equation is developed and used to calculate degree of dissociation from accurate density data. (Author)

ANL-6259 $0.75

Argonne National Lab., Ill.
ELECTRICAL RESISTANCE STUDIES OF ANODIC AND CORROSION OXIDE FILMS FORMED ON ZIRCONIUM, by R. D. Misch. Rept. on Contract W-31-109-eng-38. May 61, 37p.

ANL-6232 $0.50

Argonne National Lab., Ill.
STUDIES OF THE HYDROGEN DAMAGE MECHANISM IN THE CORROSION OF ZIRCONIUM, by R. D. Misch. Rept. on Contract W-31-109-eng-38. May 61, 20p.

NAA-SR-6384 $0.50

Atomics International, Canoga Park, Calif.
THE THERMODYNAMIC PROPERTIES OF URANYL SULFATE, by B. B. Owens and S. W. Mayer. Rept. on Contract AT(11-1)-GEN-8. 30 June 61, 13p.

PB 156 942 $6.60

Central Inst. for Industrial Research (Norway).
ELECTROCHEMICAL BEHAVIOUR OF COPPER. I. IN ACID SULPHATE SOLUTION, by Tor Hurlen. Annual technical rept. no. 1 (Special scientific rept. no. 2) 1 Jan-31 Dec 60, on Kinetics of Metal/Metalion Electrodes in Aqueous Solutions, Contract DA 91-591-EUC-1362. Jan 61, 62p. 60 refs. S I Publ. no. 298; AD-252 812.

DESCRIPTORS: *Copper, *Electrodes, *Electrochemistry, Cathodes (Electrolytic cells), Anodes (Electrolytic cells), Solutions, Iron compounds, Sulfates, Acids, Heat of reaction, Reaction kinetics, Electric potential, *Copper electrodes.

On the Kinetics of the Cu/Cu (++) (Aqueous) Electrode: Investigations were made on the anodic dissolution and cathodic deposition of copper in acid sulfate solution at 20 and 25 C. The reactions obeyed the Tafel relationship. The rate of deposition was proportional to the square of the cupric ion activity, and the rate of dissolution was independent of this activity. Heats of Activation of the Cu/CU (++) (Aqueous) Electrode: A mean standard heat of activation of 15.2 kcal was found for the Cu/Cu (++) (aqueous) electrode. On the basis of the kinetic stoichiometry and the heat of reaction of this electrode, a value of 30.6 kcal was calculated for the anode and -0.2 kcal for the cathode. Dissolution of Copper in Acidified Ferric Sulfate Solution: Measurements were made on the dissolution rate (1_c) and the mixed potential (E_c) in unstirred sulfuric acid solutions of ferric sulfate at 21 C.

PB 156 943 $7.60

Central Inst. for Industrial Research (Norway).
ELECTROCHEMICAL BEHAVIOUR OF COPPER. II. IN ACID CHLORIDE SOLUTION, by Tor Hurlen. Special scientific rept. no. 3 on Contract DA 91-591-EUC-1362. Jan 61, 71p. 34 refs. S I Publ. no. 305; AD-252 811.

DESCRIPTORS: *Copper, Ions, *Electrodes, *Electrochemistry, Cathodes (Electrolytic cell), Anodes (Electrolytic cell), Electric potential, Solutions, Deposits, Reaction kinetics, Precipitation, Acids, *Copper electrodes.

Electrochemical Behavior of Copper in Acid Chloride Solution: It was verified that copper undergoing anodic dissolution in acid chloride solution goes to the monovalent state. Depolarized Dissolution of Copper in Acid Chloride Solution: Investigations were made on the depolarized dissolution of copper by cupric, ferric, and permanganate ions in unstirred acid chloride solutions at 20 C. In the ferric and the permanganate solutions, the corrosion potential is nearly equal to the corresponding pure dissolution potential; in cupric solutions, the corrosion potential is distinctly higher than the dissolution potential. Film Growth on Copper in Acidified Cupric Chloride Solutions: The precipitation of cuprons chloride on the metal surface when the chloride concentration is below a certain limit and its effect on the reaction of Cu with cupric ions in solution was studied by rate and potential measurements. (See also PB 156 942)

PB 154 799 $1.10

Duke U., Durham, N. C.
THE DISCHARGE MECHANISM OF THE MANGANESE DIOXIDE AND OTHER OXIDE ELECTRODES, by W. C. Vosburgh. Final technical rept. Oct 57-Feb 60, on Contract DA 36-034-ORD-2560. 5p. OOR rept. 1910:5-C; AD-250 320.

DESCRIPTORS: *Manganese dioxide electrodes, *Electrodes, Oxide cathodes, Oxides, Electrochemistry, Electric discharges.

A brief summary is given of research on the discharge mechanism of the MnO_2 and other oxide electrodes. Research also included a review of the structure of some of the manganese oxides and studies of the change in open-circuit potential of the MnO_2 electrode on discharge.

PB 150 008 $4.60

Electrochemistry Research Lab., Western Reserve U., Cleveland, Ohio.
THE OXYGEN ELECTRODE IN AQUEOUS FUEL CELLS, by Ernest Yeager. Technical rept. no. 12 on Contract Nonr-2391(00). 1 Aug 60, 50p. 17 refs. AD-240 883.

DESCRIPTORS: *Fuel cells, *Oxygen electrodes, Carbon, Metals, Electrodes, *Electrochemistry, Transport properties, Polarization, *Electrolytes, Thermodynamics, Chemical reactions, Porosity, *Cathodes (Electrolytic cell), Porous metals.

Factors which control the performance characteristics of operating oxygen cathodes in aqueous fuel cell systems are considered in terms of porous carbon and porous metal electrodes. Particular emphasis is placed on porous carbon electrolytes in terms of reaction mechanisms, oxygen transport problems, lyophobic properties, and polarization measurements. Experimental data are given for the cathodic polarization associated with porous carbon electrodes as a function of current density, electrolyte, type of carbon, catalysis, and oxygen pressure. (Author)

AD-257 290 repriced $0.50

Franklin Inst. [Labs. for Research and Development] Philadelphia, Pa.
METHOD FOR PRODUCING WETTABLE SURFACES ON CONTACT LENSES BY CHEMICAL FORMATION OF INORGANIC FILMS, by Robert A. Erb. Mar 61, 13p. AFSAM rept. 61-42.

DESCRIPTORS: *Contact lenses, *Coatings, *Thin films, Titanium compounds, Oxides, Surface properties, Wetting agents.

Wettable surfaces of a permanent nature can be produced on contact lenses by means of the technic of chemical deposition of an inorganic film on the lens surface. The process is simpler, both in apparatus and procedure, than the vacuum deposition technic designed earlier for producing wettable surfaces on plastic lenses; the new process should have wide application. This report summarizes the factors involved in the process of coating a poly(methyl methacrylate) substrate with a thin film of titanium dioxide which has the properties desired--that is, transparency, wettability, adhesion, and immersion resistance. Stepwise instructions are given for the preparation of hydrophilic surfaces on contact lenses. The equipment developed for this work is relatively simple and inexpensive. (Author)

PB 155 621 $2.60

Genoa U. (Italy).
MEASUREMENT OF SELF-DIFFUSION COEFFICIENT IN SOLID ARGON, by Giovanni Boato. Final technical rept. for 1 Mar 60-28 Feb 61 on Diffusion Coefficient and Other Properties of Solid Inert Gases, Contract DA 91-591-EUC-1403. 25 Mar 61, 26p. 7 refs. AD-254 497.

DESCRIPTORS: *Argon, Crystals, *Single crystals, Vapors, Solids, *Diffusion, Test equipment, Test methods, Mass spectroscopy, Radioactive isotopes, Radiochemistry, Mathematical analysis, Theory, Gases, Measurement, Preparation, *Gas diffusion.

A comparison was made of theoretical and experimental aspects of self diffusion in solid Ar. Problems involved in the measurement of the self diffusion coefficient are discussed. A two-body interaction was assumed. The method of measurement involved growing a crystal, introduction of Ar-36 in the vapor phase, and analysis of the tracers disappearance by mass spectroscopy. The crystal was then evaporated and the evaporating gas analyzed layer-by layer. One diffusion run was carried out to completion; the diffusion lasted about 8 hr. Most

of the Ar tracer disappeared from the vapor phase indicating a diffusion coefficient at least 2 orders of magnitude higher than expected.

PB 155 624 $1.10

Indiana U., Bloomington.
SPECTROMETRIC STUDIES OF FAST REACTIONS. A DESCRIPTIVE SUMMARY, by Edward J. Bair. Final rept. on Contract AF 49(603)93. 28 Feb 61, 10p. AFOSR-356; AD-253 826.

DESCRIPTORS: *Reaction kinetics, Chemical reactions, Measurement, Spectrographic analysis, *Photochemistry, Instrumentation, *Free radicals, Ammonia, Decomposition, Oscillographs, *Flash radiography, Light, Sources, Absorption, Test methods.

The project has been directed toward quantitative high resolution measurements of the rate of free radical reactions in the gas phase. Development of new procedures (chemical modulation and multiple flash kinetics measurements), by which absorption measurements can be made are discussed. Preliminary measurements were made of the reaction involving decomposition of ammonia and the formation of NH_2 radicals. Chemical modulation in the oscilloscope patterns of repeated reactions whereby the ammonia was dissociated by a discharge are illustrated. Multiple flash kinetic measurements allow for the measurement of individual fast reactions at high resolution. Oscilloscope photographs are presented to illustrate results of this method. The lamp will operate at 100 microsecond. (Author)

PB 150 426 $11.00

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
THE ADSORPTION OF POLY-(METHYL METHACRYLATE) FROM SOLUTION, by Stuart Ellerstein and Robert Ullman. Technical rept. on Contract Nonr-83919. 1 Aug 60, 150p. 77 refs. AD-242 389.

DESCRIPTORS: *Polymer solutions, Solutions, Polymers, Acrylic resins, *Adsorption, Organic solvents, Solubility, Adsorbents, Molecular weight, Solvent action, Physical chemistry, Molecular structure, Methyl radicals.

A study was made of the adsorption of poly-(methylmethacrylate) (I) at the solid-liquid interface. Some of the parameters considered were: adsorbent, molecular weight of the polymer, shaking time, solvent power, structure of the polymer, and temperature. The adsorbents were Fe and Pyrex glass powders. The amount of I specifically adsorbed at full coverage was effectively determined by the surface area of the adsorbent as determined by N adsorption (BET) measurements. The initial rise of the isotherms was extremely steep for both adsorbents. Molecular weights of the polymers were determined by both viscosity and light scattering measurements. The amount adsorbed increased slowly with molecular weight in the range 10^4 to 10^6, although no adsorption was detected for a monomeric analog (methyl isobutyrate). The amount adsorbed was greater from poor solvents than from good ones except where a specific interaction was suspected. Some desorption experiments, wherein some of the supernatant solution was replaced by solvent after adsorption had equilibrated, revealed nonequilibrium. Similar results were obtained in temperature studies which revealed an apparent one-sidedness in the way that equilibrium was attained. Structural changes in the chemical makeup of I affected the adsorption in a marked way. A small percentage of carboxyl groups substituted for methyl ester groups caused a threefold increase in the adsorption. Stereospecific (isotactic) polymers produced an isotherm with a positive slope in the region where the random (atactic) polymer gave essentially flat plateau. (Author)

PB 171 913 $1.75

Laboratorio di Elettrochimica, Chimica Fisica e Metallurgia del Politecnico di Milano (Italy).
RESEARCH ON HYDROGEN OVERVOLTAGE ON METALLIC SINGLE CRYSTALS, by R. Piontelli, L. Peraldo Bicelli, and A. La Vecchia. Rept. for July 59-July 60 on Surface and Interface Phenomena of Matter, Contract AF 61(052)144. Feb 61, 68p. 57 refs. WADD Technical rept. 60-769.

DESCRIPTORS: *Single crystals (Metallurgy), *Electrochemistry, Silver, Lead, Tin, Nickel, Cadmium, Electrodes, Electrical properties, *Voltage, Measurement, *Hydrogen, Crystals.

Hydrogen overvoltage on silver, lead, nickel, tin and cadmium single crystals has been measured in different experimental conditions. The results have been discussed and it has been observed that the Tafel law is generally followed. (Author) (See also PB 171 079)

PB 155 556 $1.60

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
SPECTROSCOPIC STUDIES ON ORGANOMETALLIC COMPOUNDS. IV. FLUORINE NUCLEAR MAGNETIC RESONANCE SPECTRA OF SOME PERFLUOROVINYL DERIVATIVES OF METALS AND METALLOIDS, by T. D. Coyle, S. L. Stafford and F. G. A. Stone. Rept. on Contract AF 49(638)518. Mar 61, 20p. 10 refs. AFOSR-396; AD-253 821.

DESCRIPTORS: *Metalorganic compounds, Vinyl radicals, *Fluorides, Fluorine, Carbonyl radicals, *Nuclear magnetic resonance, Metallic compounds, Metals, Fluorocarbons, Molecular structure, *Hyperfine structure, Chemical properties, Iodides, Synthesis.

Fluorine nuclear magnetic resonance spectra have been obtained for 11 perfluorovinyl derivatives of B, Si, Ge, Sn, Hg, and As. Most of the spectra exhibit unexpected hyperfine structure, suggesting the possibility of long range spin-coupling in these compounds. (Author)

PB 155 459 $1.10

Mellon Inst., Pittsburgh, Pa.
INFRARED SPECTROSCOPIC STUDY OF THE PHOTOLYSIS OF CHLORINE AZIDE IN SOLID ARGON AT 4.2°K, by Dolphus E. Milligan. Rept. on Contract AF 49(638)542. 10 Mar 61, 5p. 2 refs. AFOSR-429; AD-253 425.

DESCRIPTORS: Infrared spectroscopy, Photolysis, *Chlorine compounds, *Azides, Measurement, Spectrographic analysis, Argon, Ultraviolet radiation, Diffusion, Ionization

The photolysis of chlorine azide (ClN_3) in solid argon was studied by using infrared spectroscopy; these experiments were undertaken in order to produce the chloroimino radical. Strong bands at 1/655, 1/723, 1/1143 and 1/2062 cm were found in the ClN_3 spectrum, with a weak band at 1/2137 cm. On irradiation the strong bands decreased while the 1/2137-cm band remained unchanged; new bands developed at 1/818 + or - 0.5 and 1/824 + or - 0.5 cm. There was evidence of a greenish-blue phosphorescence from the irradiated deposits after the UV light was extinguished.

PB 155 092 $3.60

Midwest Research Inst., Kansas City, Mo.
RESEARCH, STUDIES, AND INVESTIGATIONS OF THE TEMPERATURE DEPENDENCE OF LUMINESCENCE EFFICIENCY OF PHOSPHORS, by Gordon E. Gross. Final rept. 15 May 58-15 May 59, on Contract DA 44-009-eng-3491. 22 June 59, 32p. 12 refs; AD-230 627.

DESCRIPTORS: *Luminescence, Temperature, Phosphors, Excitation, Measurement.

Work accomplished during the year is summarized to determine the influence of the following factors on the luminescence efficiency of various phosphors: (1) excitation spectrum, (2) composition of phosphor (including activators), and (3) temperature of phosphor at time of emission. Since the temperature dependence of the various phosphors studied influences their capability as heat sensing devices, the increased knowledge of their physical properties could lead to improvement in their thermal sensitivity and, hence, to improve heat sensing ability. The work was concentrated on increasing just the knowledge of the physical characteristics of the phosphor and in establishing experimental techniques for highly precise measurements of the temperature sensitivity. (Author)

PB 150 187 $2.60

Ohio State U. Research Foundation, Columbus,
ANODIC POLARIZATION BEHAVIOR OF IRON-NICKEL ALLOYS IN SULFURIC ACID SOLUTIONS, by George Economy, Rudolph Speiser and others. Technical rept. no. 5 on Contract Nonr-495(11). Aug 60, 26p. 18 refs. AD-241 306.

DESCRIPTORS: *Iron alloys, *Nickel alloys, *Electrochemistry, Electrolytes, Anodes (Electrolytic cells), Polarization, Sulfuric acids, Corrosion inhibition.

An investigation was made of (1) the anodic polarization behavior of Fe-Ni alloys in H_2SO_4 solutions and (2) the transition in behavior with changing composition and pH value. X-ray analyses of the annealed specimens showed (1) α (ferrite) up to 5 at.-% Ni, (2) $\alpha + \gamma$ from 10 to 40 at.-% Ni, and (3) γ (austenite) from 50 to 100 at.-% Ni.

PB 157 068 $13.00

Olin Mathieson Chemical Corp., Niagara Falls, N. Y.
PRODUCTION OF LITHIUM IN THE 30,000-AMPERE PHOTOTYPE ELECTROLYTIC CELL, by J. G. Cecala and R. I Elliot. Technical research rept. on Proj. HEF, Contract AF 33(600)33920. 8 Oct 59, 181p. OMCC-HEF-218; AD-232 957.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Lithium, Production, Lithium compounds, Chlorides, Electrolysis, Electrochemistry, *Electrolytic cells.

An electrolytic cell was designed and electrochemical operating techniques were developed to determine the feasibility of the use of such equipment for the continuous production of Li metal. The process involved charging a eutectic mixture of LiCl and KCl to the cell to form a melt in which electrolysis took place. During the electrolysis, Li was released at the cathode and Cl at the anode; both products were recovered for subsequent use. The 30,000-amp cell was operated continuously for 146 days at an average current of 20,900 amp, with a current efficiency of 86.8%. The purity of the products was 99.6% for the Li and over 99% for the Cl. About 27 tons of metal were produced.

PB 150 635 $1.10

Pennsylvania State U., University Park.
MAGNETIC PROPERTIES OF SOME RARE EARTH CHELATES OF ETHYLENEDIAMINETETRAACETIC ACID AND ACETYLACETONE, BETWEEN 1.3 AND 77.2°K. Technical rept. no. 3 on Contract Nonr-65624 and rept. on National Science Foundation Grant no. 9928. 12 Aug 60, 6p. 10 refs. AD-243 942.

DESCRIPTORS: *Chelate compounds, Rare earth compounds, Magnetic properties, Acetic acids, Acetones, Acetyl radicals, Ethylenes.

PB 157 112 $1.60

Pennsylvania State U., University Park.
PROTONATION EFFECTS ON $\underline{n} \rightarrow \pi^*$ TRANSITIONS IN PYRIMIDINE, by V. G. Krishna and Lionel Goodman. [Technical rept. no. 1, pt. 2b, on Bonding in Nitrogen and Boron Rings, Contract Nonr-65621]. [1959] 14p.

DESCRIPTORS: Boron compounds, Nitrogen compounds, Heterocyclic compounds, *Chemical bonds, *Pyrimidines, Forbidden transition, Protons, *Solvent action, Spectrographic analysis.

The T→S luminescence spectra at 77° in several rigid glasses are reported for pyrimidine and pyrimidine hydrochloride. The emission is assigned $^3B_1 (n, \pi^*) \rightarrow {}^1A$ from the mirror image relationship with the $^1A \rightarrow {}^1B_1 (n, \pi^*)$ absorption spectrum in pyrimidine. The 0,0 band is observed at 28,300 ± 20 cm^{-1} yielding an observed singlet-triplet interval of 2,630 cm^{-1}. Both the observed singlet-triplet interval and the observed principal vibrational progression in the

spectrum (1066 cm^{-1} - out of plane distortion suggest the π orbitals of the nitrogen atoms are not in sp^2 hybridization in the excited state. The observed primidine hydrochloride emission proves that the hydrogen bond is broken in the excited state. A similar conclusion is drawn from the pyrazine hydrochloride emission (also reported), thus placing the well known $n \rightarrow \pi^*$ absorption blue shift on a sound theoretical basis. A relationship between H-bond energy and the absorption blue shift is proposed and confirmed for the three diazines. (Author)

PB 156 262 $3.60

Pennsylvania State U., University Park
SOLVENT EFFECTS ON $n \rightarrow \pi^*$ TRANSITIONS IN PYRAZINE, by V. G. Krishna and Lionel Goodman. Technical rept. no. 1, pt. 2a, 15 July 58-15 July 59, on Bonding in Nitrogen and Boron Rings, Contract Nonr-65621. [1959] 35p. 17 refs. AD-247 225.

DESCRIPTORS: Boron compounds, Nitrogen compounds, Heterocyclic compounds, *Chemical bonds, *Pyrazine, Forbidden transitions, Protons, *Solvent action, Spectrographic analysis.

The $T \rightarrow S$ and $S \rightarrow S'$ spectra of pyrazine and 2, 5-dimethylpyrazine in hydrocarbon and EPA glasses has been measured. The $S \rightarrow S'$ and $S \rightarrow T$ spectra of the same compounds in ethanol and isopentane are also reported. When due correction is made for the effect of the rigid media, solvent shifts (from hydrocarbon to EPA) of 60 cm^{-1} to the red in emission and the same amount to the blue in absorption are obtained. The data is explained in terms of the weak electrostatic interaction of the nonbonding electrons with the proton and the Franck-Condon strain resulting from it. It is shown that due to the change in the extension of the π orbitals in nitrogen atom of N-heterocyclics, a Franck-Condon destabilization energy - the difference of energies between the equilibrium state and the nonequilibrium Franck-Condon state - results in protonic solvents. The role of the Franck-Condon principle in the $n \rightarrow \pi$ blue shift phenomenon is suggested to be of greater importance than assumed up to now. The previously reported discrepancy of 500 cm^{-1} in the 0-0 bands of the $T \rightarrow S$ emission and $S \rightarrow T$ absorption of these compounds is entirely explained by media effects. (Author)

PB 154 212 $11.50

Process Developments, Inc., Philadelphia, Pa.
PROCESS DESIGN STUDY OF PROPOSED LIQUID OXYGEN GENERATING CYCLE, by M. Patrick Sweeney. Final rept. on Contract DA 44-009-eng-3505. Dec 58, 156p. 53 refs. AD-230 826.

DESCRIPTORS: *Oxygen, Liquified gases, Production, Air, Design, Gas turbines, Axial-flow compressors, Nitrogen, Heat exchangers.

The proposed LOX generating cycle utilizes an auxiliary working fluid, recycled N, which is produced in the cycle itself. Because the impurities in the cycle are high boiling, none of them pass into the N which originates as the overhead product from the distillation. No special purifying provisions such as reversing exchangers and mass unbalance systems are necessary in the heat exchange of the N. About 83% of the impurities and contaminants entering the system in previous cycles are eliminated. The use of recycled N permits the production of high-purity N, as well as O, from a single distillation column. Refrigeration is available at several levels for more efficient cooling of the O which is to be condensed as a product. A major portion of the net liquid produced is obtained by expanding the air into the wet or 2-phase region. The Rotemperator, a newly designed compact regenerator, is used. The weight of heat storage matrix is reduced to only about 3% of that required for a stationary regenerator. Column pressure is reduced to about 18 psia. The cold section, including the main- and side-exchanger systems for a 30 ton/day LOX plant will require less space than that available in a single 35-ft semi-trainer, as compared to 2 full semi-trailers for previous 20 ton/day units.

PB 154 773 $2.60

[Sheffield U. (Gt. Brit.)]
CHARGE TRANSFER COMPLEXES IN ATOM RECOMBINATION, by George Porter and Thomas A. Gover. Final technical rept. no. 3, 1 Jan-31 Dec 60, on Contract DA 91-591-EUC-1365. 25 Jan 61, 26p. 9 refs. AD-251 233.

DESCRIPTORS: *Iodine, Atomic spectrum, Atomic charge, *Spectrographic analysis, Absorption, *Photolysis, Bromides, Iodides, Ethanes, *Recombination reactions, Benzenes.

Transient absorption spectra have been detected after flash photolysis of iodine in a variety of solvents. There is some correlation between the wavelength of maximum absorption and the ionisation potential of the solvent, and the spectra are attributed to the charge transfer complexes between iodine atoms and the solvent. In case of methyl iodide as chaperon a weak transient was also observed in the vapor phase. The decay of the complex follows a second order law and rate constants were measured in six solvents. Values for the extinction coefficient are derived by assuming that the reaction is diffusion controlled. Equillibrium constants of complex formation were measured in ethyl iodide and ethyl bromide. (Author)

PB 150 259 $1.60

Washington U., Seattle.
DECOMPOSITION OF ACTIVATED SEC-BUTYL RADICALS FROM DIFFERENT SOURCES AND UNIMOLECULAR REACTION THEORY [AND] CALCULATION OF DENSITY OF VIBRATIONAL ENERGY LEVELS FOR SYSTEMS OF HARMONIC OSCILLATORS, by R. E. Harrington, B. S. Rabinovitch, and H. M. Frey. Technical rept. no. 5 on Contract Nonr-477(14). 20 Aug 60, 17p. 15 refs. AD-243 093.

DESCRIPTORS: *Butyl radicals, *Decomposition, Vibration, Hydrogen, Deuterium, Excitation, Density, *Atomic energy levels, *Harmonic oscillators, Mathematical analysis, Statistical analysis.

I. The study of the unimolecular decomposition of chemically activated sec-butyl radicals to give propylene and methyl was extended to include radicals formed from H and D atoms with butene-1. Within experimental error, reasonable correspondence was obtained in both

present and earlier work between observed values and those calculated under the assumptions that all internal degrees of freedom are active and that rate of reaction varies with total excess internal energy. In a general way, these findings tend to support the importance of vibrational anharmonicity, and the model of coupled vibration modes. The formation of activated sec-butyl radicals from butene-1 and cis-butene-2 involves different processes. Since the radicals are formed in uniquely different ways, but decompose at virtually the same rates, migration of internal energy among the various vibrational modes presumably occurs before decomposition. II. Tolman's method (Statistical Mechanics, Oxford Univ. Press, 1938. p. 492), the use of the inversion integral, and the expression of the partial function as a power series are briefly reviewed. Consideration is also given to 2 arithmetic methods which involve direct counting procedures and calculation by a statistical method.

EARTH SCIENCES

PB 149 894 $5.60

Electrical Engineering Research Lab., U of Texas, Austin.
A GEOMAGNETIC MICROPULSATION MEASURING SYSTEM UTILIZING AIR-CORE COILS AS DETECTORS, by R. R. Boothe, Jr., B. M. Fannin, and F. X. Bostick, Jr. Rept. on Contract Nonr-375(01). 1 Aug 60, 60p. 11 refs. Rept no. 115; AD-240 881.

DESCRIPTORS: *Terrestrial magnetism, Oscillation, Measurement, Instrumentation, Magnetic fields, Circular coils, Amplifiers.

A system for measurement of geomagnetic micropulsations is described in detail. Air-core coils are used as detecting antennas to measure the three components of the geomagnetic field variations. The amplification system utilizes D-C chopper amplifiers while the desired system response is accomplished through the use of operational amplifier filters. Some data samples which show various day and night micropulsations are included. (Author)

Climatology and Meteorology

PB 155 798 $7.60

Arctic Inst. of North America, Washington, D. C.
METEOROLOGICAL OBSERVATIONS IN NORTHERN ELLESMERE ISLAND. 1959, by J. R. Lotz. Scientific rept. no. 11 on Contract AF 19(604)3073. Feb 61, 75p. Research paper no. 7; AFCRL-248; AD-254 567.

DESCRIPTORS: *Meteorological data, *Meteorology, Arctic regions, Tables, *Diurnal variations, Temperature, Precipitation, Wind.

Meteorological and micrometeorological data from the Ice Rise and Ice Shelf Stations are presented with comparative data from Alert and Eureka. Radiation data are not included.

PB 156 903 $5.60

Army [Signal Missile Support] Agency, White Sands [Missile Range] N. Mex.
THE WHITE SANDS MISSILE GEOPHYSICS RESEARCH TOWER, by Henry Rachele and M. E. McLardie. Special rept. 7 on Missile Geophysics Program. July 57, 56p. 22 refs. AD-137 498.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Meteorological instruments, Guided missile research, Instrumentation, Towers, Wind, Geophysics, Temperature, Measurement.

This report consists of a discussion of the most significant characteristics of each type of meteorological instrument which was selected for collecting wind velocity and temperature data from the Missile Geophysics Research Tower. A description of the tower structure, terrain, and climate of the area, including photographs, is incorporated to give an over-all picture of the area in which the data is taken and the relative positions on the tower where each parameter is measured. (Author)

BNL-652 $0.75

Brookhaven National Lab., Upton, N. Y.
A STUDY OF THE WIND PROFILE IN THE LOWEST 400 FEET OF THE ATMOSPHERE, by I. A. Singer and C. M. Nagle. Progress rept. no. 8, 16-Sep 60-15 Jan 61, on Contract R-65-8-99812 SC-04-91. Jan 61, 30p.

PB 154 898 $1.60

Deutscher Wetterdienst, Offenbach (West Germany).
TEMPERATURE AND DENSITY CHANGES IN THE TROPOSPHERE AND LOWER STRATOSPHERE WITH COLD-FRONT PASSAGES, by H. D. Schneider and H. Faust. Special, technical and scientific rept. no. 1 on The Cell Structure of the Atmosphere, Contract DA 91-591-EUC-1668. 25 Jan 61, 13p. 10 refs. AD-251 882.

DESCRIPTORS: *Air mass analysis, *Temperature inversion, Stratosphere, Atmosphere, Density, Meteorological data.

The problem of contrary behavior of temperature and density in an air mass of high vertical extent is treated by means of statistics. Simultaneously the analysis is intended to give some first qualitative and quantitative information on short-period and small scale density changes. (Author)

PB 155 526 $3.60

Genoa U. (Italy).
RADIOGONIOMETRIC INVESTIGATION OF THUNDERSTORMS AND CLOUDS OF GREAT ELECTRICAL ACTIVITY, by Mario Bossolasco. Final technical rept. no. 1, 1 Sep 59-28 Feb 61, on Contract DA 91-591-EUC-1270. Mar [61.] 32p. 9 refs. AD-254 440.

DESCRIPTORS: *Meteorology, *Atmospherics, *Direction finding, *Thunderclouds, *Storms, Italy, Atmosphere, Atmospheric electricity, Instrumentation, Cathode ray tubes, Propagation, Electronic circuits, Electromagnetic waves.

Results obtained in the radiogoniometric investigation of thunderstorms and clouds of great electrical activity are presented. Observations recorded with the Ceraunometer (Electric-field-change counter) installed in stations at Genova, Monte Capellino, Livorno, and Sauze d' Oulx are treated. Preliminary results are presented with an Atmoradiograph obtained at Genova in the frequency of atmospherics at a radius of 500 to 1000 km. Details are given of the cathode rays direction finder (CRDF), and methods adopted for its control, especially those used in the interpretation of fotograms. Chief results derived from the first months of observation made in Genova and Livorno with the CRDF are treated.

PB 155 731 $3.60

[Imperial Coll. of Science and Tech., London (Gt. Brit.)]
THE USE OF GLIDERS IN THE INVESTIGATION OF ATMOSPHERIC THERMALS, by Betsy Woodward. Annual technical rept. no. 1, 1 Mar 60-28 Feb 61, on Convection, Contract DA 91-591-EUC-1420. 28 Feb 61, 38p. AD-254 651.

DESCRIPTORS: *Gliders, Vertical indicators, Ground speed indicators, *Air mass analysis, *Atmosphere, Meteorology, Velocity, *Gusts, Meteorological data, Wind.

A glider was used to study atmospheric thermals. Transverses were made through individual thermals while readings of airspeed, rate of climb, attitude, time and altitude were recorded every half second on 16mm cine film. From these readings, a cross-section through the thermal of vertical and horizontal velocities of the air was sought. A constant aircraft attitude was maintained. The changes in airspeed then was a measure of the changes in horizontal wind, and the vertical speed of the glider was a measure of the vertical wind. Computations were made to ascertain if the technique would yield sufficiently accurate data for the wave lengths of interest. Data were analyzed and corrections applied to the readings. Some of the results are presented to explain and show the validity of the technique. (Author)

PB 154 305 $1.60

Technischen Hochschule, Munich (West Germany).
INVESTIGATION OF ATMOSPHERICS IN THE FREQUENCY RANGE OF 0-100 CYCLES PER SECOND BY MEANS OF MEASUREMENTS WITH NARROW BAND AMPLIFIERS, by Hans Günther Jungmeister. Final technical rept. no. 2, 1 Oct 59-30 Sep 60, on Contract DA 91-591-EUC-1306. [1960[18p. 1 ref. AD-250 165.

DESCRIPTORS: *Atmospherics, *Frequency analyzers, *Electrostatics, Amplifiers, Narrowband, Germany, *Lighting.

A frequency analyzer, was used for continuous recording to investigate atmospherics. Analysis of the recording strips confirmed the main points of the results, already obtained from broad band measurements. Since the frequency analyzer is able to separate the multitude of signal types and disturbances, existing in the atmosphere, only according to frequencies, but not according to waveforms and causes of generation, it proved to be impossible to adjoin an observed spectral amplitude to a specific broad band observed atmospheric signal. Furthermore, the frequency range of 0.05 - 1.5 c was investigated using wide band amplifiers. In this range purely electrostatic signals were found. It was not possible to trace any magnétic component of the measured electric signals. (Author)

Geology

TEI-779 $2.25

Geological Survey, Washington, D. C.
GEOLOGIC INVESTIGATIONS IN SUPPORT OF PROJECT CHARIOT, PHASE III, IN THE VICINITY OF CAPE THOMPSON, NORTHWESTERN ALASKA, by R. Kachadoorian, R. H. Campbell, and others. Preliminary rept. Jan 61, 109p.

PB 150 386 $1.10

Marine Lab., U. of Miami [Coral Gables] Fla.
CARIBBEAN SEA EXPEDITION, "CARIB". [Rept. on Contract Nonr-840(01)] Aug 60, 6p. ML 60156; AD-242 658.

DESCRIPTORS: *Geological survey, Caribbean Sea, *Hydrographic surveying.

ENGINEERING

PB 156 344 $9.10

Armour Research Foundation, Chicago, Ill.
RADIATION STREAMING IN SHELTER ENTRANCEWAYS, by C. W. Terrell, A. J. Jerri and others. Final rept. on Contract NBy-3185. Oct 60, 106p. 53 refs. ARF 1158-12.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Underground structures, *Gamma rays, *Neutrons, Transmission, Albedo, Ducts, Measurement, Reflection, Concrete, Lead, Protective shelters, Shelters.

The objective of the work is to study, describe and measure the transport of nuclear radiation through air ducts having walls of different materials. Particular emphasis is placed on full scale concrete ducts which are intended for use as underground shelter entranceways and contain a right angle bend. It is shown that a modified albedo theory will rather accurately describe

the transmission of both gammas and neutrons in lead and concrete ducts. Theory is compared with experimental measurements of gamma dose and neutron flux attenuation factors. Neutron number albedo measurements are made and reported. Work by various theorists and experimenters is included for completeness and comparison. This program points out direction future programs should take and the areas in which major emphasis is needed. (Author)

PB 156 862 $6.60

Norwegian Ship-Model Experiment Tank, Trondheim.
PRACTICAL SHIP FORMS OF MINIMUM WAVE RESISTANCE, by J. K. Lunde and H. AA. Walderhaug. Rept. no. 1 on Contract N62558-2235. Aug 60, 62p. AD-245 547.

DESCRIPTORS: *Ship models, Water waves, Resistance Model tests, Naval vessels, Merchant vessels, Design, Ship hulls, *Hydrodynamics, Model basins.

The results are presented of an investigation of the practical feasibility of ship forms of minimum wave resistance. The investigation comprised the design and construction of a basic model which, after having been tested at Froude Number 0.5, was redesigned to give practical hull forms of a naval vessel and a passenger-ship. Models of these ships were tested and the results compared with forms of Taylor's Standard Series. The study indicates that the theoretical forms of minimum wave resistance may profitably be applied for the design of high speed ships, but, that due regard must be taken to viscous effects and the theoretical lines modified with this in mind. At the designed speed, i.e. Froude Number = 0.5, the models of the naval vessel and the passengership of minimum wave resistance, experienced less wave resistance than the comparable forms of Taylor's Standard Series. Around the hump at F = 0.3, however, the forms of Taylor's Standard Series were decidedly best, a result which might have been expected. (Author)

PB 171 911 $3.00

Southwest Research Inst., San Antonio, Tex.
AN INVESTIGATION OF THE USE OF ACOUSTIC VIBRATIONS TO IMPROVE HEAT TRANSFER RATES AND REDUCE SCALING IN DISTILLATION UNITS USED FOR SALINE WATER CONVERSION, by I. A. Raben, George Commerford, and Robert Dietert. Rept. on Contract 14-01-001-188. Mar 61, 164p. 18 refs. Office of Saline Water Research and Development Progress rept. no. 49.

DESCRIPTORS: *Sea water, *Desalination, *Evaporators, Heat transfer, Scale, Countermeasures, Acoustics, Vibration.

The present research program has demonstrated the technical feasibility of using acoustic energy to improve the economy of evaporator operation in saline water conversion. It has been shown that improvement in water side heat transfer coefficients can be obtained by the use of acoustic vibrations in the viscous and turbulent flow. Improvement varied from 450% at a Reynolds number of 540 to 16% at a Reynolds number of 16,000. It is felt that greater improvement can be obtained at higher flow Reynolds numbers with the use of larger vibration equipment. The experimental unit utilized the transverse vibration of a pipe with water flowing on the outside of the pipe in an annular space. The data were correlated using both vibration and flow Reynolds number parameters. The effect of acoustic vibration on steam condensate film heat transfer coefficient was also studied. The program also evaluated the effect of vibration on the formation of scale on a heat transfer surface under boiling and nonboiling conditions.

PB 157 059 $6.60

Stanford U., Calif.
DESIGN PARAMETERS FOR SUBSONIC AIR-AIR EJECTORS, by J. W. Mitchell. Technical rept. no. 40 on Contract Nonr-225(23). 31 Dec 58, 63p. 10 refs. AD-212 391.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Air ejectors, Design, Model tests, Exhaust gases, Gas turbines, Turbines.

The present extensive use of the ejector as a fluid pump has brought into focus the need for an adequate ejector design procedure. An analysis is presented that provides a relation for ejector behavior in terms of the governing nondimensional parameters. Model tests are presented which (a) verify the analysis, and (b) establish the numerical values for the two design coefficients that are required. The intended application of this procedure was originally one involving the exhaust of a gas turbine as the driving fluid. The numerical values of the parameters have been confined to a range consistent with this application, and in this sense only the analysis is limited.

Aeronautical Engineering

PB 153 559 $1.60

Avco Corp., Nashville, Tenn.
DESIGN, DEVELOPMENT AND FABRICATION OF A LIGHT WEIGHT AIRFRAME. Monthly progress rept. no. 6 for Oct 60 on Contract DA 33-008-ORD-1968. 15 Nov 60, 17p; AD-247 803.

DESCRIPTORS: *Airframes, Design, Aluminum alloys, Honeycomb cores, Welding, Welded joints, Explosive forming.

(See also PB 152 967)

PB 154 926 $2.60

Avco Corp., Nashville, Tenn.
DESIGN, DEVELOPMENT AND FABRICATION OF A LIGHT WEIGHT AIRFRAME. Monthly progress rept. no. 7 for Nov 60 on Contract DA 33-008-ORD-1968. 15 Dec 60, 26p; AD-251 431.

DESCRIPTORS: *Airframes, *Guided missile noses, Aluminum alloys, Honeycomb cores, Design, Explosive forming, Welding, Welded joints, Rocket noses. (See also PB 152 967)

PB 154 984 $1.60

Avco Corp., Nashville, Tenn.
DESIGN, DEVELOPMENT AND FABRICATION OF A LIGHT WEIGHT AIRFRAME. Monthly progress rept. no. 9 for Jan 61 on Contract DA 33-008-ORD-1968. 15 Feb 61, 15p; AD-251 847.

DESCRIPTORS: *Guided missile noses, Design, *Airframes, Aluminum alloys, Honeycomb cores, Explosive forming, Welded joints, Welding, Rocket noses.

See also PB 153 559

PB 157 066 $10.10

Booz, Allen and Hamilton, Chicago, Ill.
MOISTURE CRITERIA FOR AIRCRAFT AND AIRBORNE EQUIPMENT, by C. Frank Riley, Jr. and Paul F. Walker. Rept. no. 3 on Environmental Criteria for Aircraft and Airborne Equipment, Contract AF 33(616)2689. June 55, declassified 1 Dec 60, 128p. 229 refs. WADC Technical note 55-97; AD-88 062.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Aircraft equipment, Moisture, Design, Countermeasures, *Airborne.

The many forms of moisture can critically affect both the functional and the operational performance of aircraft and airborne equipment. The characteristics of these moisture forms, their extremes, world-wide distribution and effects, and preventive measures, are presented in this report. Design criteria are discussed, and the standard design requirements and test procedures are listed. Moisture effects aircraft and equipment in five principal ways: (1) directly through absorption and surface contact, (2) impingement of precipitation, (3) icing, (4) corrosion and (5) fungus growth. Although adequate preventive measures usually are available to designers, in the past these effects have resulted in substantial damage to equipment and have reduced operating effectiveness of various air units. The principal moisture problems are currently being reduced by improved materials and greater design attention. However, as aircraft speeds increase, the damage suffered through precipitation erosion and hail impact is becoming a major concern. A bibliography of additional information sources on moisture is provided (Author)

PB 156 887 $2.60

Communication and Navigation Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
ERROR ANALYSIS, TYPICAL COLLISION-AVOIDANCE SYSTEM, by Blinn W. Russell, Jr. Rept. for Mar 59-May 59, 28p. 1 ref. WADC Technical rept. 59-199; AD-213 839.

This report released for sale to the public 18 July 61.

DESCRIPTORS: *Aviation accidents, *Aviation safety, Air speed, Data transmission systems, Errors, Flight paths, Jet planes, Aircraft, Mathematical analysis.

A method of error analysis, applicable to any type of "cooperative" collision avoidance system (CAS), is described by illustrative example. (A cooperative CAS is one requiring complementary equipment in protected aircraft.) The analysis yields figures for an effectiveness factor. This is defined as the ratio of valid alarms to unnecessary alarms for a system designed to prevent all collisions (based upon the assumptions of the report.) Horizontal cooperative turns and a data-transmission type of CAS are chosen for illustrative purposes. Warning times need not exceed 18 seconds for all airspeeds of 350 mph or less. Maximum air-to-air required detection ranges are not over 3 miles for these lower airspeeds. Required detection ranges will be of the order of 20 miles for jets traveling at Mach 3. (Author)

PB 171 264 $1.50

David Taylor Model Basin, Washington, D. C.
DESIGN STUDY OF A 26-FOOT GEM, by Harvey R. Chaplin. Apr 61, 60p. Rept. 1521; Aero rept. 999.

DESCRIPTORS: *Ground effect, Machines, Design, *Flying platforms, *Aircraft.

A design study is carried out for a GEM based on a set of nominal specifications including: a 3-foot operating height, a 1200-pound payload, and an 80-knot speed. Preliminary examination of requirements leads to selection of a very lightly loaded 29-foot-effective-diameter planform, with a gross weight slightly over five tons. Performance calculations are carried out for both fixed and variable tangential deflection (β_V), for a single-fan and for a twin-fan design. Performance improves as the complexity of the design increases, but the simplest design (single-fan configuration with $\beta_V = 15^o$, fixed) requires only about 25 percent more power than the best design (twin-fan configuration with β_V variable). For this simple design, the problems of matching fan and engine are worked out, grade-climbing calculations are made, static longitudinal and lateral stability and dynamic lateral stability are calculated, the control problem is examined, and calculations for the turning maneuver are made. These studies are not made in complete detail, but are in sufficient detail to give reasonable assurance that no major problems would arise unexpectedly during development. (Author)

PB 171 912 $7.00

Minnesota U , Minneapolis.
WADC [AND] UNIVERSITY OF MINNESOTA CONFERENCE ON ACOUSTICAL FATIGUE, ed. by W. J. Trapp and D. M. Forney, Jr. Rept. on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5426. Mar 61, 502p. 275 refs. WADC Technical rept. 59-676.

DESCRIPTORS: *Acoustics, *Fatigue (Mechanics), *Failure (Mechanics), *Materials, *Aircraft, *Jet engine noise, *Rockets, *Rocket motor noise, *Hypervelocity vehicles, Conferences.

The conference was designed to establish communication between individuals from the several disciplines involved in acoustical fatigue problems, namely, acoustics, applied mechanics, and service failure analysis. It was hoped thereby that an improvement in the over-all understanding of the acoustical fatigue problem would ensue. Another important objective was to define clearly the critical problem areas and aspects which would require emphasis in the future.

AD-255 532 repriced $1.00

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF LOW-SUBSONIC FLIGHT CHARACTERISTICS OF A MODEL OF A HYPERSONIC BOOST-GLIDE CONFIGURATION HAVING A 78 DEGREE DELTA WING, by John W. Paulson and Robert E. Shanks. May 61, 31p. Technical note D-894; Supersedes NASA TM X-201, AD-221 637.

Also available from NASA, Washington, D. C., as NASA Technical note D-894.

DESCRIPTORS: *Triangular wings, Swept-back wings, *Hypervelocity vehicles, *Subsonic flow, Tests, Wind tunnels, Stability, Control.

A model was flown over an angle-of-attack range from 10 to 35 degrees. Longitudinal stability and control characteristics were generally satisfactory with neutral or positive static longitudinal stability. The addition of artificial pitch damping resulted in satisfactory longitudinal characteristics with large amounts of static instability. The most rearward center-of-gravity position for which sustained flights could be made either with or without pitch damper corresponded to the calculated maneuver point. The lateral stability and control characteristics were satisfactory up to about 15 degree angle of attack. The damping of the Dutch roll oscillation decreased with increasing angle of attack the oscillation was about neutrally stable at 20 degree angle of attack and unstable at angles of attack of about 25 degrees and above. Artificial damping in roll greatly improved the lateral characteristics and resulted in flights being made up to 35 degree angle of attack. (Author)

AD-255 529 repriced $1.50

National Aeronautics and Space Administration, Washington, D. C.
METHOD FOR CALCULATING INDUCED VELOCITIES AT THE BLADES OF A SLIGHTLY INCLINED PROPELLER WITH CONSTANT CIRCULATION, by Harry H. Heyson. May 61, 59p. 11 refs. Technical note D-818.

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-818.

DESCRIPTORS: *Gas flow, *Velocity, *Propeller blades, Wake, Axially symmetric flow, Numerical analysis, Vortices, *Aerial propellers.

A method for calculating the induced velocities at the blades of an inclined propeller is presented. The calculations are based upon an assumed wake consisting of one skewed helical vortex per blade. The blade circulation is assumed constant with respect to both radial and azimuth positions. The restriction of uniform radial circulation can be removed by superposition however, the assumption of constant azimuth-wise circulation restricts the analysis to small propeller inclinations. Numerical values have been obtained for one wake skew angle. These values indicate large effects due to wake vortex spacing and to the number of blades. (Author)

PB 150 953 $2.60

Princeton U., N. J.
A PRELIMINARY EVALUATION OF THE USE OF AN AIRSHIP AS A TEST VEHICLE FOR VTOL/STOL AIRCRAFT MODELS, by D. C. Hazen, R. F. Lehnert and H. E. Payne. Rept. on Contract Nonr-1858(14). Aug 60, 28p. 2 refs. Aeronautical Engineering rept. no. 520; AD-243 207.
DESCRIPTORS: *Airships, Flight testing, *Aerodynamics, *Vertical take-off planes, Model tests, Test methods, Substitutes, Wind tunnels, *Airplanes.

A velocity survey was conducted in the region extending 12 feet below the car of ZS2G-1 airship. A qualitative investigation of the vibration levels existing within the car throughout the available speed range of 25 to 65 knots was also conducted. The ZS2G-1 airship was modified to incorporate a retractable strut extending down through the bomb bay. On the end of the strut a specially modified three-component strain gage balance was installed. Two models were tested: the first, a three-foot span model of a generalized tilt wing VTOL/STOL cargo aircraft; the second, a six percent thick delta wing having an aspect ratio equal to one. For the purposes of these evaluation tests neither model was powered. The fuselage angle of attack of the tilt wing model was held constant while the angle of wing tilt, and hence wing angle of attack, was varied from zero to stall. The angle of attack of the delta wing was varied from -10^{o} to $+35^{o}$. Although the results of these tests have indicated areas in which appreciable improvements in instrumentation will be required, they have conclusively demonstrated that the airship test vehicle supplies test conditions superior to those obtainable in wind tunnels. The level of turbulence is extremely low since atmospheric turbulence is of much larger scale than that produced in the wind tunnel, and most importantly for powered VTOL/STOL models, no wind tunnel wall corrections are required. (Author)

PB 156 746 $11.00

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
AFTERBODY DRAG REDUCTION BY APPLICATION OF THE AREA RULE ACCOUNTING FOR JET EXHAUST, by J. G. Ballinger and R. C. Horn. Final rept. on Jet Drag, Contract AF 33(616)3160. Dec 57, declassified 18 Nov 59. 142p. 73 refs. WADC Technical rept. 57-634; AD-142 335.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Drag, Reduction, Exhaust systems, Jets.

Wind tunnel tests were performed at Mach numbers from 0.8 to 1.24 to determine the interference drag effects of a propulsion jet exhausting from the rear of a typical fighter aircraft of the F-100 class, and to investigate the feasibility of minimizing the afterbody drag through application of the transonic area rule, including the propelling jet as an extension of the body. Tests were conducted with a sonic nozzle at jet-to-stream pressure ratios of no net, 5.36, 12.5, and 19.9. Cross section area was added in the region of the jet exit by two separate methods. The resultant area distribution at a jet-to-stream pressure ratio of 12.5, including the cross section area of the propelling jet, was that of a Parker minimum drag body.

PB 157 071 $1.60

School of Aviation Medicine [Brooks AFB] Tex.
ASSESSMENT OF INSTRUMENT FLYING PERFORMANCE: FURTHER METHODS FOR AUTOMATIC RECORDING OF AN AIRCRAFT'S FLIGHT PATH, by Roger Brown Loucks. 11 Dec 45, 14p. 8 refs. Proj. no. 383, rept. no. 2; ATI-115 176.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Flight paths, *Recording systems, Aircraft, Tests, Automatic, *Instrument flight, Performance.

Two types of apparatus have been constructed which will plot an aircraft's flight path automatically. A technique is also described for recording the flight path at a ground station as well as in the aircraft itself. One of the two recording systems plots the aircraft's position independently of any special data regarding wind direction, wind velocity, and air speed. The systems provide records which can be evaluated immediately upon termination of any particular flight maneuver. The records readily lend themselves to direct interpretation inasmuch as each tracing constitutes a scaled plotting of the aircraft's flight path on a conventional map. When desired, an elevation profile can be traced synchronously with the azimuth patterns provided by the two systems described in this paper. (Author)

PB 157 069 $1.10

Wichita U., Kansas.
WIND-TUNNEL INVESTIGATION OF SHROUDED PROPELLERS, by Robert K. Wattson, Jr. Progress rept. for Apr 57 on Contract Nonr-201(01). May 57; declassified 3 Dec 57. 9p. Engineering rept. no. 286; AD-149 090.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Shrouded propellers, Model tests, *Wind tunnel models, Aerodynamics.

Portions of this report are illegible.

PB 157 070 $2.60

Wichita U., Kansas.
WIND-TUNNEL INVESTIGATION OF SHROUDED PROPELLERS, by Vernon O. Hoehne. Progress rept. 1 Dec-31 Dec 57, on Contract Nonr-201(01). Jan 58, 27p. 2 refs. Engineering rept. no. 305; AD-156 872.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Shrouded propellers, Model tests, Aerodynamics, *Wind tunnel models, Moments, Pressure.

Activities on the wind tunnel investigation of shrouded propellers consisted primarily of data reduction of the force, moment and pressure data from the wind tunnel tests of Model Nos. 213 and 213A. Data reduction of the force and moment data from tests of Model No. 213 has been completed to uncorrected values and Model No. 213A data is now being reduced exclusively. Static test results from Model No. 213A have been plotted and included in this report along with the propulsive efficiency at two model configurations at zero degree angle of attack. (See also PB 157 069)

Electrical and Electronic Engineering

AD-257 423 repriced $1.00

Advanced Semiconductor Lab., General Electric Co., Syracuse, N. Y.
APPLICATION OF TUNNELING TO ACTIVE DIODES, by N. Holonyak, Jr. Scientific rept. no. 4b on Contract AF 19(604)6623. Mar 61, 37p. 3 refs. AFCRL-347(b).

DESCRIPTORS: *Diodes, *Semiconductors, Gallium compounds, Arsenides, Crystals, Growth.

A description is given of a simple means of masking against epitaxial GaAs crystal growth on a GaAs seed. The properties of manganese-doped GaAs tunnel diodes are described. An all-germanium-doped GaAs tunnel diode and its properties are described. The dependence of hump tunnel currents upon minority carrier injection in a variety of tunnel diodes is outlined. Some of the measured properties of manganese-doped GaAs are presented. (See also AD-257 387)

AD-257 334 repriced $1.25

Advanced Semiconductor Lab., General Electric Co., Syracuse, N. Y.
TUNNEL DIODE CHARACTERISTICS AND CIRCUIT CONSIDERATIONS, by E. A. Fisch. Scientific rept. no. 4c on Contract AF 19(604)6623. Mar 61, 42p. 2 refs. AFCRL-347(c).

DESCRIPTORS: *Diodes, *Semiconductors, *Switching circuits, Voltage, Transients, Germanium, Tests.

Observations of the transient response of tunnel diodes during high speed (1 nanosecond) switching are discussed with special attention to the lack of limiting. Techniques for measuring diode characteristics are discussed. Rise time measurements performed on tunnel diodes and on an analog circuit are discussed. (See also AD-257 423)

PB 150 261 $1.10

Armour Research Foundation, Chicago, Ill.
HIGH POWER TRANSDUCERS, by R. R. Whymark. Quarterly rept. no. 5, 16 May-31 Aug [60] on Contract [Nonr] 2900(00). 31 Aug 60, 3p. ARF 1149-5.

DESCRIPTORS: *Magnetostriction transducers, Transducers, Design, Magnetostriction.

The work has been directed toward the effects of static compressive stress on a bar magnetostrictor. (See also PB 147 498)

PB 152 081 $8.60

Cabot, Godfrey L., Inc., Boston, Mass.
DEVELOPMENT OF BATTERY GRADE CARBON BLACK, by R. E. Dobbin, Howard Weaver and George F. Friauf. Final rept. 1 July 51-28 Feb 54, including Progress rept. no. 10, 1 Oct 53-28 Feb 54, on Contract DA 36-039-sc-15352. 10 May 54, 100p. AD-34 009.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Carbon black, Dry cells, Tests, Pressure, Atomization, Fuels, Combustion chambers, Resistance.

The investigation of atomizing pressure of the fuel indicated no benefit pressures above 100 psig. The study of spray-angle and oil-rate effect revealed that a wider spray angle produced more structure in the black, but too wide an angle produced coke in the furnace. A reduction in structure and a slight increase in electrical resistance were noted when the oil rate was increased from 30 to 35 gal/hr. A summary of all previous reports on the contract is presented.

PB 156 385 $10.10

Diamond Ordnance Fuze Labs., Washington, D. C.
TECHNICAL REVIEW, VOLUME I, NUMBER I, OCTOBER 1957. [1958] 122p. 24 refs.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Transistors, *Amplifiers, Temperature, Ferrites, Spheres, *Grinders, *Circuits, Voltage, Modulators, *Induction motors, Space charges, *Klystrons, Dielectric properties, *Castings, *Resins, *Shock waves, Supersonic wind tunnels.

Contents:
Temperature-stabilized RC-coupled transistor amplifier, by Thomas A. Prugh
Ferrite-sphere grinder, by Frank Reggia and Wm. Stadler
A stable decision circuit for a D-C voltage pattern, by James Samuel
Compact microwave single-sideband modulator using ferrites, by J. C. Cacheris and H. A. Dropkin
Low-inertia induction motors, by M. Apstein and L. Blum
Space-charge effects in klystrons, by Wm. E. Waters
Dielectric properties of several casting resins, by R. W. Tucker, J.I. Cooperman, and P. J. Franklin
Spark shock waves in a supersonic wind tunnel, by F. T. Harris, E. L. Resler, Jr., and J. Guarracini

PB 157 063 $2.60

Dikewood Corp., Albuquerque, N. Mex.
SURVEY: INFORMATION CAPACITY OF A FLUCTUATING LINK, by B. L. Basore. Rept. on Contract AF 30(602)1890. 28 Nov 58, 26p. 10 refs. QR-2-1004; RADC-TN-58-382; AD-207 071.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Communication systems, Information theory, Tests.

The unpredictable fluctuations in a communication link such as caused by ionospheric multipath and scattering increase the equivocation which accompanies a received signal. This Technical Note consists of a summary of work which has been completed and published concerning this effect and describes the status of knowledge in this problem area. A formal solution appears in the literature to the following problem: What is a useful lower bound to the information capacity of a fluctuating link? This formal solution has been applied to a number of specific cases, and in each such case it is shown that the effect of the fluctuations may be expressed in terms of a reduced signal-to-noise ratio in the Shannon formula for the capacity of a continuous, band-limited channel perturbed by additive, white gaussian noise and subject to the same maximum power limitation that applies to the fluctuating link.

PB 157 064 $1.60

Dikewood Corp., Albuquerque, N. Mex.
SURVEY: NOISE-PERTURBED FEEDBACK IN COMMUNICATIONS, by Bennett L. Basore and L. Wayne Davis. Rept. on Contract AF 30(602)1890. 29 Aug 58, 20p. 4 refs. QR-1-1004; RADC-TN-58-295; AD-148 967.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Communication systems, Tests, Noise (Radio), Information theory.

This Technical Note attempts to summarize the status of the problem area of the performance of a communication link with a noise-perturbed feedback link. Accounts in the literature are discussed which show that feedback can be used to reduce the final probability of error in the decision process taking place at the receiver. This improvement is accomplished primarily by permitting the receiver to postpone or eliminate decisions in the cases where it is recognized that messages are received with high ambiguity. It is recommended that a further study confine itself to a comparison of the error probabilities for feedback systems and for redundancy in the direct communication channel using the same total capacity for all systems.

PB 157 072 $11.50

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE EQUIANGULAR SPIRAL ANTENNA, by John D Dyson. Technical rept. no. 21 on Contract AF 33(616)3220. 15 Sep 57, 156p. 11 refs. AD-145 019.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Antennas, *Helixes, *Broadband, *Slot antennas, Design.

The planar equiangular spiral antenna with a balanced feed was shown to exhibit the characteristics associated with an infinite structure. Each arm of the equiangular spiral antenna is defined by 2 identical equiangular spiral curves, one rotated through a fixed angle around the origin with respect to the other. These antennas can be metallic spiral arms suspended in free space or spiral slots cut in a large conducting sheet. The bandwidth of these antennas is limited only by the arm length. Investigation showed that such antennas provide circularly polarized, single lobe, bidirectional radiation, perpendicular to the antenna plane. For frequencies such that the antenna arms are very short in terms of wavelength, the radiated field is linearly polarized. As the arm length of frequency is increased the field on the axis perpendicular to the plane of the antenna becomes elliptically and then circularly polarized. The beamwidth varies with rotation in the plane of the antenna, and since the pattern rotates with frequency, the apparent beamwidth will vary with frequency for a fixed $\emptyset$ cut. This variation is typically from 40^{o} to 60^{o}. The more tightly wound spirals and the antennas with broader arms have the most uniform patterns. The input impedance converges with increasing frequency. The slot antenna is rarely mismatched to a 50-ohm line by more than 3:1.

PB 155 235 $8.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
A PREDICTIVE MODEL FOR SELF ORGANIZING SYSTEMS, by Gordon Pask and Heinz Von Foerster. Technical rept. no. 4 on Contract Nonr-1834(21). 30 June 60, 90p. 33 refs. AD-245 969.

DESCRIPTORS: *Learning, Mathematical analysis, *Games theory, *Communications theory.

Self organizing systems with reference to an observer are studied. It is called self organizing because of the observational expedients which must be adopted in order to make its behavior appear consistent. These expedients are dictated by a peculiarity--that if the system is self organizing, an observer will be structurally uncertain about whatever model he builds to represent it. Concentration is placed upon an application of the game theoretic analogy in which it is moderately certain what a system will do, but ignorant (by logical necessity and not through lack of effort) about the structural aspects of the model. The argument is developed with reference to two pieces of experimental work. The first is called a social interaction experiment, in which the players are human subjects who interact with one another. Their interaction is restricted by certain constraints (which change as a function of the interaction), and in particular by a limited supply of a commodity (called money), which players must use in order to purchase the channels of communication via which they interact. The second set of experiments concern artefacts. In the simplest case, players are replaced by automata. (Author)

PB 154 798 $7.60

Fordham U., New York.
A STUDY OF THE SCINTILLATION PROCESS IN VERY FAST PHOSPHORS, by Bernard J. Dunn and Daniel F. McDonald. Final rept. 20 Oct 59-19 Oct 60, on Contract [DA] 30-069-ORD-2869. [1960] 78p. 19 refs. OOR rept. 2443:1-P; AD-247 282.

DESCRIPTORS: *Phosphors, *Electron beams, Excitation, Cathode ray tubes, Scintillation counters, Design, Electron tubes, Single crystals, Organic compounds, Solutions.

Apparatus for fast electron-beam excitation of organic scintillators is described. A special cathode-ray tube is used to provide a beam current of 1 milliampere at up to 55 kilovolts. The beam is scanned at high speed across an electron permeable foil. Scintillators positioned against the window externally receive up to 50,000 Mev of electron beam excitation in less than 0.5 x 10 to -10 power seconds. Light pulse recording is accomplished using a 1P28 photomultiplier and an EG&G traveling wave oscilloscope. The electron beam apparatus is used to study the rise time of the scintillation pulse in scintillator solutions of anthracene in benzene and p-terphenyl in toluene. The theory of energy transfer in liquid solutions of Kallmann and Furst (Phys. Rev. 78:857, 1950; 81:853, 1951, 85:816, 1952) predicts a dependency of rise time on concentration. The rise time is a measure of the rate of filling of excited levels in the scintillator solute by energy transfer from the initially excited solvent. Observed rise-time variations agree with the theory of Kallmann and Furst. The spectra of single crystal scintillators and solutions of the same scintillators in various solvents is studied. The effects of solvent dielectric constant suggest excition transfer as the energy transfer mechanism. (Author)

AD-257 387 repriced $1.00

General Electric Research Lab., Schenectady, N. Y.
APPLICATIONS OF TUNNELING TO ACTIVE DIODES, Scientific rept. no. 4a on Contract AF 19(604)6623. 28 Mar 61, 36p. 5 refs. AFCRL-347(a).

DESCRIPTORS: *Diodes, Semiconductors.

The characteristics of forward injection failure in GaAs tunnel diodes are summarized. A model involving rapidly diffusing impurities and junction traps is proposed as the failure mechanism. The diffusion and solubility of Cu in heavily doped GaAs has been examined. This impurity is found to diffuse rapidly at low temperatures in p-type GaAs and is suspected of being an important contributor to the failure process. Drift experiments have shown that the rapidly diffusing species is uncharged in p-type material, contrary to expectations. The effectiveness of various procedures for removing Cu from the surface or volume of GaAs specimens have been studied. To date, however, we have not been successful in constructing diodes that are free of this type of failure. The dependence of tunneling upon uniaxial strain in Ge has been studied further and a theoretical model which qualitatively accounts for the data is presented. As and Sb doped junctions behave quite differently, and it is expected that further study of these differences will provide an understanding of the

phonon-assisted and unassisted components of tunneling in these materials. An important source of error has been eliminated from the elastoresistance equipment. The results of some measurements on n-type CdS crystals are reported. (See also PB 154 892)

AD-256 938 repriced $0.50

General Electric Co., Schenectady, N. Y.
INVESTIGATION FOR THE DEVELOPMENT OF CERAMIC BODIES FOR ELECTRON TUBES, by H. R. Wisely. Scientific rept. no. 2 on Contract AF 19(604)7410. 8 May 61, 13p. 4 refs. AFCRL-344.

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Thermal expansion, *Quartz crystals, *Silicates.

A continuing search of the literature on thermal expansion data of ceramic materials has so far uncovered several compositional areas that appear worthy of experimental exploration as possible sources of high thermal expansion materials. These include microcrystalline quartz, γ-alumina and alkaline-earth silicates. A number of papers, in which thermal expansion data on members of solid-solution series are given, seem to indicate a lack of correlation between thermal expansion and variation in composition. (Author)

PB 156 769 $5.60

Kidde, Walter, and Co., Inc., Belleville, N. J.
STATIC SWITCHING DEVICES, by G. Marks and E. Demers. Quarterly progress rept. no. 1, 1 July-30 Sep 58, on Contract DA 36-039-sc-78170. [1958] 51p. 1 ref. Rept. 2128-Q1; AD-207 988.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Electronic relays, *Switching circuits, Design, Semiconductors, Transistors, Tests, Circuits, Relays.

The design of a basic static relay is presented. The experimental data and theoretical considerations leading to the choice of a circuit design resulting in reliable operation are discussed. These considerations include the heat problem, required power gain, reliable snap-action actuation, isolation and fast and chatter-free operation. A simple modification of the basic relay circuit to operate in a latching mode is discussed. Here the latching is accomplished by biasing the input circuit of the basic relay into the "backlash" region between input operate voltage and input release voltage. A method of obtaining latching by means of positive feedback as well as the design of a polar relay based on two basic relays is discussed.

PB 155 696 $1.10

Lund U. (Sweden).
A METHOD FOR MAINTAINING CONSTANT POWER DISSIPATION TO A CALORIMETER CIRCUIT OVER A WIDE TEMPERATURE INTERVAL, by Kjell Rosengren. Technical note no. 4 on Contract [AF] 61(052)46. 1 Oct 60, 7p. AFOSR-110; AD-254 331.

DESCRIPTORS: *Thermoelectricity, Electricity, Theory *Calorimeters, Measurement, Circuits, Resistance, Power supplies, Control systems, Electric servomechanisms

An arrangement is suggested for measuring, with high precision, electrical power supplied to a calorimeter system across a varying resistance. The power introduced through the heater is kept nearly constant by a resistance in series, and the only operation during the heating time is to keep the energy source at constant voltage. (Author)

PB 157 001 $1.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
VARIABLE SHORT CIRCUIT METHOD FOR MEASURING CABLE-TO-RIGID LINE VSWR, by John W. E. Griemsmann and Louis Coltun. Rept. on Contract NObsr-52078. 12 Dec 52, 16p. Rept. no. R-297-52; PIB-236.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Transmission lines, Jacks (Electricity), *Electric cables, Electric connectors, Joints, Reflection, Microwave frequency, Impedance, Circuits, Coaxial cables, Transformers.

Presented in detail is a simple direct method for measuring the reflections from a plug and jack connector combination with one end attached to cable. It is demonstrated that the method is based on the conformal transformation of a variable reactance on the end of the cable into a circle on the Smith Chart representing the input impedance. Experimental results demonstrate the method of measurment and the formation of the circular Smith Chart loci for the two important practical cases. (Author)

AD-255 294 repriced $2.75

Naval Research Lab., Washington, D. C.
DIRECT ENERGY CONVERSION LITERATURE ABSTRACTS. Mar 61, 121p. 547 refs.

DESCRIPTORS: *Power supplies, *Energy, *Bibliography, *Thermoelectricity, *Fuel cells, *Thermionic emission, *Photoelectric cells, Electrochemistry, Primary batteries, Storage batteries, Solar energy, Nuclear energy, Magnetohydrodynamics, *Solar cells, Materials, Alloys, Design, Generators, Indexes, Semiconductors, Silicon.

This bibliography contains 547 annotated references on direct energy conversioh covering the following topics; (1) energy conversion (general, bibliographies, and patents) (2) thermoelectricity (3) thermionic emission (4) photoelectric processes (5) magnetohydrodynamics (6) electrochemical processes and (7) energy sources. Entries are grouped into these sections alphabetically by author or by title if the author is lacking for research reports the listing is alphabetical by issuing agency. The number of items pertaining to each topic and subtopics is indicated. Of the 547 references, 387 are entered under thermoelectricity. An alphabetical author index is also included.

PB 155 782 $1.60

Nobel Inst. of Physics, Stockholm (Sweden).
USE OF CATHODE RAY TUBES IN PULSE-HEIGHT SPECTROSCOPY, by P. Thieberger and L. Bergström. Technical note no. 4 on Contract AF 61(052)118. 10 Dec 60, 14p. 3 refs. AFOSR-226; AD-254 971.

DESCRIPTORS: Electron tubes, *Cathode ray tubes, Cathode ray tube screens, *Oscilloscopes, Oscilloscope screens, Photomultipliers, Gamma ray spectroscopy, Pulse analyzers, Measurement, Sweden, Crystal detectors, Nuclear energy, *Pulse height analyzers, Radioactivity, Tests.

The possibility of using cathode ray oscilloscopes for pulse height analysis in gamma ray measurements was studied. Two ways of generating signals obtained when the beam of a CRT hits a certain part of its screen were used for single channel manual (one oscilloscope used) and automatic (two oscilloscopes used) analysis of pulse spectra from NaI-crystal detectors. The signals were obtained either by viewing the screen of a conventional CRT by means of a photomultiplier tube or by making use of a specially designed CRT provided with additional internal electrodes from which pulses were directly derived. From the results obtained, it was concluded that the equipment described is well suited for energy and intensity comparisons of gamma rays. It is shown that the energy linearity is good and that it is possible to record photo peaks corresponding to gamma-energies as low as about 5 KeV. Compared to conventional set-ups, this arrangement showed several advantages with no additional limitations. (Author)

PB 152 306 $3.60

Pacific Semiconductors, Inc., Culver City, Calif.
INTRINSIC-BARRIER TRANSISTOR TECHNIQUES (SILICON), by J. L. Buie, M. A. Clark and others. Quarterly rept. no. 2, 15 Oct 57-15 Jan 58, on Contract DA 36-039-sc-74887. [1958] 38p. PSI Rept. no. 3000:15-7-Q; AD-162 322.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Transistors, *Silicon, Packaging, Crystals, Production, Tests, Very high frequency, Oscillators, Diffusion theory.

The basis for an n-p-i-n intrinsic-barrier transistor is a set of processes for n-p-n transistors, incorporating a fourth region: the n+ collector contact. Such a process has been established. The resulting transistors operate efficiently as oscillators at 70 mc. Analysis of the diffused structure shows that by simple modifications the intrinsic-barrier structure can be built. (Author) (Engineering--Electronic, 5 Sep 61)

PWAC-349 $0.75

Pratt and Whitney Aircraft Div., United Aircraft Corp., Middletown, Conn.
THE ELECTRICAL RESISTIVITY OF LITHIUM AND SODIUM-POTASSIUM ALLOY. Rept. on Contract AT(11-1)-229. 30 June 61, 33p.

AD-257 312 repriced $0.75

Rome Air Development Center, Griffiss AFB, N. Y.
PERFORMANCE OF THE TAP-100 THERMOELECTRIC CONVERTER, by John E. McCormick. Apr 61, 21p. RADC TN-61-26.

DESCRIPTORS: *Thermoelectricity, *Transducers, *Propanes, Heat exchangers, Tests.

This report describes the TAP-100 Thermoelectric Converter which was designed and fabricated for Rome Air Development Center by the New Products Division of Westinghouse Electric Corporation Details of performance of the equipment are included. The device was operated to failure with the test program being divided into three parts as follows: (1) a preliminary evaluation during which a number of short runs were conducted so that loading and fuel consumption data could be obtained for various hot junction temperature levels; (2) a life test of the device; and (3) final testing, conducted just prior to disassembly. After testing, the device was disassembled and the failure mechanics analyzed. Results indicated failure was caused by a combination of numerous internal shorts and severe junction breakdown. (Author)

PB 156 738 $16.00

Stanford Research Inst., Menlo Park, Calif.
RESEARCH ON DESIGN CRITERIA FOR MICROWAVE FILTERS, by S. B. Cohn, E. M. T. Jones and others. Final rept. 15 Mar 55-15 Apr 57, on Contract DA 36-039-sc-64625. June 57, 249p. 65 refs. SRI Proj. 1331; AD-157 528.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Radiofrequency filters, Design, Waveguides, Transmission lines, Microwaves, Cavity resonators, Band-pass filters.

The present state of UHF and microwave filter design is summarized. Low-pass bandpass, multiple pass-band and directional type filters utilize coaxial line, strip line, and waveguide in their construction. The relative merits of synthesizing these filters by the standard image-parameter methods and by newer insertion-loss methods are discussed. The new design formulas are presented in charts for waveguide, TEM-transmission-line, and lumped-constant filters. A new class of compact, easy-to-construct filters that utilize parallel-coupled transmission lines is described, and a derivation is given of the image-parameter description of low-pass, band-pass, all-pass, and all-stop realizations. A class of 4-port multiplexing filters was also studied. The unique properties of these directional filters are that they are matched at all frequencies and that a signal of variable frequency fed into one port emerges unattenuated at another port for all but a certain band of frequencies, while in this band the signal emerges essentially unattenuated from a third port.

PB 154 495 $7.60

Synthetic Mica Co., Caldwell, N. J.
DEVELOPMENT OF HIGH-TEMPERATURE (500°C) INORGANIC GLASS DIELECTRIC FOR EMBEDDING ELECTRONIC PARTS, by T. W. Weber and P. S. Hessinger. Final rept. 9 Oct 58-9 Oct 59, on Contract NObs-77025. [1959] 73p. 31 refs. AD-231 578.

DESCRIPTORS: High temperature research, *Dielectrics, Ceramic materials, Electronic equipment, Mica, Glass, *Binders, *Embedding substances.

Development work was conducted to prepare a glass-based dielectric material which could be applied to electronic component parts at temperatures below 500°C but which would be thermally and electrically stable to temperatures of 500°C or above. Experiments to date have included a thorough evaluation of melting behavior and fluidity of various binary and ternary glass systems at temperatures up to 500°C. Using a lead borate eutectic as the base, the effects of additions of various simple and complex halide compounds and refractory additives on fusion characteristics have been studied. Dielectric measurements were made on the most promising systems at elevated temperatures. The application of synthetic mica as a high temperature embedment utilizing various inorganic binders has been studied. Compositions using a combination of aluminum phosphate refractory and glass frit binder can be cured at 450°C to form a hard, strong embedment with acceptable dielectric properties which is stable to well over 500°C. (Author)

Ordnance, Missiles, and Satellite Vehicles

PB 155 888 $8.10

Air Force Missile Development Center, Holloman AFB, N. Mex.
CENTRAL INERTIAL GUIDANCE TEST FACILITY GUIDE. VOLUME I. FACILITIES AND CAPABILITIES, by Harold V. Wright. Apr 61, 87p. 10 refs. AFMDC-TR-61-9; AD-254 913.

DESCRIPTORS: Standardization, *Test facilities, Test equipment, Test Methods, Guidance, *Guided missile research, Guided missiles, Control test vechiles, Control, Control systems, *Inertial guidance, Flight testing, Reliability, Laboratory equipment, *Data processing systems, Gyroscopes, Computers, Rocket propelled sleds, Research program administration, *Aeronautical laboratories, *Tracks (Aerodynamics), Instrumentation, *Telemeter systems.

An independent testing agency within the Air Force, the Central Inertial Guidance Test Facility (CIGTF) has been established to provide a USAF capability for standardized development testing of guidance and control systems and components. In order to determine those factors necessary to evaluate the accuracy and reliability of a system, the CIGTF relies on laboratory tests, environmental tests, sled tests, and flight tests. Sled testing is considered supplementary to laboratory testing and complementary to flight testing necessitating a close correlation of the results from each. A brief description of the facilities and equipment of each organization making up the CIGTF is included in this report along with short outlines of testing philosophy, methods, and procedures. (Author)

PB 156 734 $1.60

Naval Ordnance Test Station, China Lake, Calif.
PROPELLANT EVALUATION TESTS WITH THE 250-POUND MOTOR, by Dean H. Couch and Donald G. Nyberg. Rept. for 1 Oct 57-May 59. 1 Mar 60, 19p. 5 refs. NOTS TP-2369; NAVORD rept. 7012; AD-236 434.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Rocket motors, Test equipment, *Liquid rocket propellants, Design, Nitric acid, Hydrazines, Methyl radicals, Tetrazenes, Specific impulse, Exhaust gases.

The development and present status of the 250-pound thrust test motor is described. The motor consists of a centromix injector, uncooled stainless steel chamber, and a water cooled copper nozzle. The characteristic length (L*) of the motor is 70 in. and it has an expansion ratio of 3.53. The motor operates at a nominal chamber pressure of 300 psia with a total propellant flow rate of one pound per second. Specific impulse and characteristic exhaust velocity (c*) are obtained from the thrust and chamber pressure measurements. The standard propellant combination used for comparison with new propellant systems is inhibited red fuming nitric acid (IRFNA)- unsymmetrical dimethylhydrazine (UDMH). This standard system gives a specific impulse of 228 sec and a characteristic exhaust velocity of 5,200 ft/sec at an oxidizer-to-fuel (O/F) ratio of 2.5 to 2.7 with no correction for heat losses. IRFNA-hydrazine gave a specific impulse of 234 sec and a c* of 5,400 ft/sec. IRFNA-tetramethyltetrazene gave a specific impulse of 217 sec and a c* of 4,970 ft/sec. (Author)

AD-257 189 repriced $10.00

Picatinny Arsenal, Dover, N. J.
ENCYCLOPEDIA OR EXPLOSIVES AND RELATED ITEMS. VOLUME I: A TO AZOXY, by Basil T. Fedoroff, Henry A. Aaronson and others. 1960, 722p. 357 refs. PA TR-2700.

DESCRIPTORS: *Explosives, *Encyclopedias.

Contents:
Introduction
Nomenclature
Physical tests used to determine explosive properties
Abbreviations, code names, and symbols
Abbreviations for books and periodicals
Descriptive text of encyclopedic items
Table I. Comparison of US, British and German Sieve Series
Table II. Calibers of US and Foreign Ammunition
Index of subjects as alternate names of items

SC-4614(RR) $1.00

Sandia Corp., Albuquerque, N. Mex.
HIGH EXPLOSIVE CRATER STUDIES: DESERT ALLUVIUM, by B. F. Murphey. May 61, 43p.

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Food

PB 155 173 $1.60

Arctic Aeromedical Lab. [Fort Wainwright] Alaska.
VITAMIN CONTENT OF ARCTIC PLANTS AND THEIR SIGNIFICANCE IN HUMAN NUTRITION, by Kaare Rodahl and Joan Rodahl. Aug 52, 19p. 12 refs. Proj. no. 22-1101-0002, part 1; Public rept. 41.

DESCRIPTORS: *Plants, Arctic regions, Nutrition, Ascorbic acid, Sources.

On the basis of the available information, the nutritional value of arctic plants has been discussed, and the vitamin C contents of 69 species of arctic plants from Greenland and Alaska have been reported. On the basis of the reported findings it may be concluded that vitamin C is well distributed through the more common artic flora. When the natural resources of this vitamin are properly utilized there should be no reason to suffer from vitamin C deficiency in arctic regions, even without supplies of special antiscorbutic substances from more temperate zones. As a source of calories for man, the arctic flora is of little importance. (Author)

PB 155 170 $5.60

[Army] Medical [Research] and Nutrition Lab. [Denver, Colo.]
ARCTIC WINTER RATION TRIALS, 1950, by Denver I. Allen, Frederick Sargent and others. 1 Apr 50, 53p. 15 refs. AAL Public rept. 15.

DESCRIPTORS: *Military rations, Arctic regions, Nutrition, Physiology, Climate

Small rapid weight changes occurred in all test groups during the trials. Average hemoglobin, hematocrit, serum protein, and serum chloride values for men on the Ration, Arctic, Trail (AT-1) did not change significantly during the trial phases indicating a satisfactory maintenance of electrolyte and water balance. With the exception of the meat bar, the components of the Ration, Arctic, Trail (AT-1) were acceptable. The utility aspects of this ration were, in all major respects, satisfactory. No nutritional or metabolic evidence was noted in these trials which would contraindicate the use of this ration, when properly prepared and consumed, by healthy young men engaged in vigorous activity for periods of seven days or less.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 171 585 $1.00

Naval Research Lab., Washington, D. C.
NAVY HIGH-IMPACT SHOCK MACHINES FOR LIGHTWEIGHT AND MEDIUMWEIGHT EQUIPMENT, by I. Vigness. Interim rept. 1 June 61, 40p. 33 refs. NRL rept. no. 5618.

DESCRIPTORS: *Naval equipment, Tests, *Impact shock, *Machines, Design, Shock waves, Analysis, *Shock, Test equipment.

Descriptions are given of the Navy HI shock machines for lightweight and mediumweight equipment. Shock motions are given for standard loading conditions. These are illustrated by acceleration-, velocity-, and displacement-time relations. Maximum values of velocities and displacements, and of accelerations passed by various low-pass filters, are presented. Shock spectra are presented for selected conditions. Equivalent displacement- and velocity-shock, together (Machinery, Fabrications and Accessory Equipment, with maximum values of acceleration, can be established for their respective effective frequency ranges from observations of the shock spectra. Concepts relative to the specification of shock tests are considered. These include brief considerations of analyses of shock motions, methods of specifying a shock test, and what is meant by simulation of field conditions. It is indicated that shock tests should not be specified in terms of shock motions, or spectra, unless the values specified be considered only as nominal values. (Author)

PB 171 896 $6.00

Lockheed Aircraft Corp., Burbank, Calif.
HIGH ENERGY RATE METAL FORMING, by F. C. Pipher, G. N. Rardin, and W. L. Richter. Final technical engineering rept. for 18 Oct 57-1 Aug 60, on High Energy Rate Metal Forming, Contract AF 33(600)35543. Oct 60, 438p. 57 refs. AMC TR-60-7-588; AD-254 776.

DESCRIPTORS: *Explosive forming, Metals, *Sheets, *Airframes, *Spaceships, Explosives, Production, Shaped changes, Metallurgy, Titanium alloys, Processing.

High energy rate metal forming techniques for airframe and spacecraft sheet metal applications are presented. The forming techniques demonstrate that the controlled application of the energy available from high velocity explosives is a safe, efficient and economical production forming method. The inherent advantages, as well as the limitations of this new forming method, are presented for consideration in the design and production of difficult to form sheet metal components. Explosive forming techniques were developed for (5) different configurations. Multiple operations were employed as required by the material used and the severity of the forming operations. Descriptions of the explosives and methods for preparation of cylindrical, linear and shaped charges are presented. Metallurgical, stress corrosion and mechanical property data is included. Tank design criteria were established. (Author)

LAMS-2546 $0.50

Los Alamos Scientific Lab., N. Mex.
A SIMPLIFIED PLASMA PROPELLER, by H. W. Lewis. Rept. on Contract W-7405-eng-36. 6 Apr 61, 16p.

Machine Parts and Mechanisms

PB 152 288 $4.60

General Electric Co., Schenectady, N. Y.
GAS-LUBRICATED CYLINDRICAL JOURNAL BEARINGS OF FINITE LENGTH. PART I: STATIC LOADING, by B. Sternlicht. Technical rept. on Contract Nonr-2844(00). 15 Aug 60, 41p. 5 refs. AD-243 775.

DESCRIPTORS: *Gas bearings, *Journal bearings, Load distribution, Gases, Lubricants, Reynolds number, Mathematical analysis, Lubrication.

This paper presents numerical solutions of the Reynolds equation for finite length, gas-lubricated cylindrical journal bearings under static loading. (The load has constant magnitude and direction with respect to the bearing.) The results are presented in dimensionless form which can be readily used by design engineers. Comparisons of the iterative solutions and the first-order perturbation and the "linearized ph" methods are made. CONCLUSIONS: The results obtained by iterative procedure correlate best with experiment. At this time the Elrod-Burgdorfer method of analysis for infinitely long journal bearings with end flow correction factors obtained by first-order perturbation correlates best with the iterative procedure. At low eccentricity ratios, $\epsilon > 0.3$, the load carrying capacity obtained by first-order perturbation agrees very well with iterative procedure. The attitude angle does not correlate very closely. The linearized ph method of analysis presents an improvement over the first-order perturbation and it has closer correlation with the iterative method. Up to $\epsilon > 0.5$ the load carrying capacity obtained by this method agrees very well with the iterative procedure. The attitude angle does not correlate closely, but it is closer than the first-order perturbation. (Author)

PB 156 891 $5.60

Naval Engineering Experiment Station, Annapolis, Md.
PROPULSION GEAR MATERIALS: INVESTIGATION OF CASE CARBURIZING STEELS AND PRACTICES, by M. R. Gross and H. M. Rawlings. Rept. no. 5. 25 Nov 60, 56p. 8 refs. Research and Development rept. 910016B.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Propulsion gears, Tests, Fatigue (Mechanics), Hardenability, *Marine propellers, *Steel, Metallurgical analysis, Gears, Materials.

This is the 5th report on an investigation of case carburizing steels and practices for application in marine propulsion gears. The report completes and summarizes an investigation encompassing 6 different carburizing steels and 10 co-operating manufacturers. The steels studied are AISI-4617, TS-8620, 3310, 9310, 4820, and 2320. Data are presented on the composition, hardenability, thermal properties, microstructure, hardness gradient, carbon gradient, bending fatigue resistance, and rolling fatigue resistance of these steels. Inspection of the measured variables showed no significant correlations. Significant differences were observed among both steels and processors in bending fatigue, and among processors in rolling fatigue. Shot peening did not improve bending fatigue strength appreciably. The minimum desirable case/core ratio was found to be approximately 0.25. (Author)

PB 156 892 $2.60

Naval Engineering Experiment Station, Annapolis, Md.
THE TOROID CONTACT ROLLER TEST AS APPLIED TO THE STUDY OF ANTIFRICTION BEARING MATERIAL, by W. J. Greenert. 5 Dec 60, 28p. 12 refs. Research and Development rept. 910154B

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Ball bearings, *Roller bearings, Steel, Friction, Tests, Fatigue (Mechanics), Shear stresses, Statistical analysis, Bearings, Materials.

This investigation was undertaken to provide an understanding of the basic mechanics and statistical variables of the contact roller test as it is applied to surface fatigue phenomena of antifriction bearing materials. One hundred ninety-four contact rollers of AISI 52100 bearing quality steel were tested to establish dispersion limits. No significant fatigue differences were indicated for heats, bars, or test replications among steels of similar quality, composition, or heat treatment. A statistical evaluation of results points to the contact roller test as a suitable means for studying significant variables that pertain to both the theoretical and material aspects of antifriction bearings. Stresses in the contact surfaces based on the orthogonal shear stress theories showed good correlation with fatigue life. (Author)

MATERIALS

PB 155 633 $1.60

Borden Chemical Co., Philadelphia, Pa.
STUDY LEADING TO THE DEVELOPMENT OF HIGH TEMPERATURE RESISTANT ADHESIVES, by B. D. Halpern and J. Dickstein. Quarterly progress rept. no. 2, 22 Sep-22 Dec 60, on Contract DA 36-034-ORD-3316. [1960] 18p. 6 refs. AD-253 989.

DESCRIPTORS: *Adhesives, *Resin adhesives, *Metal plastic adhesives, Polymerization, *Heat resistant polymers, Methyl radicals, Phenyl radicals, Thermosetting resins, X-ray diffraction analysis, Triazines, Benzenes, Polymers, Bromination, Alcohols, Chemical reactions, Substitution reactions.

The preparation of several heat-stable polymeric systems, representative of backbones containing phenylene and triazine rings are described. X-ray diffraction patterns were determined on 5 polymeric systems. The results were: (1) polyphenyl - essentially amorphous; (2) polyphenyl ether with OH at one end and H at other end - some well-ordered crystalline regions; (3) polyphenyl ether with OH at one end and Br at other end - shows even more crystallinity than (2); (4) benzoguanamine -diphenyl carbonate condensation polymer - highly crystalline; (5) melon - very slight crystallinity present. Tensile shear tests on degreased Al strips gave 3400 and 2100 psi for compounds (2) and (3), respectively. The methyl groups of the polyxylenols were

successfully oxidized to a polymer containing 41% carboxyl groups by permanganate oxidation. This polymer retains the original heat stability of the parent polymers. The effect of the carboxyl groups on metal adhesion is being studied. The methyl groups of the polyxylenols were successfully brominated with N-bromosuccinimide. As a result of the excellent heat stability displayed by the polyxylenols, an ortho cresol-formaldehyde polymer (low molecular weight) was prepared. (Author) (See also PB 171 565)

AD-258 028 $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
ANALYSIS OF THE CATALYST PORTION OF A TWO-PACKAGE EPOXY COATING SYSTEM BY ULTRAVIOLET SPECTROPHOTOMETRY, by M. L. Adams. 8 May 61, 12p. CCL #105.

DESCRIPTORS: Coatings, *Epoxy resins, *Catalysts, Thiols, *Ultraviolet spectroscopy, Spectrographic analysis, Sprays, Printed circuits, *Plastic coatings, Resins.

The catalyst portion of a two package epoxy spray type coating for printed circuitry, as outlined in a proposed Military Specification, is required to contain on a weight basis, fifty parts flexibilizer, a difunctional mercaptan made from 98 mole percent of bis-(2-chloroethyl) formal and 2 mole percent of trichloropropane; twenty parts activator, a liquid polymer of 2, 4, 6 tri-(dimethylaminomethyl) phenol; and thirty parts solvent. methyl ethyl ketone. An ultraviolet spectrophotometric method for the analysis of this catalyst has been developed in which the three components are simultaneously determined by measuring the absorbance of a chloroform dilution of the catalyst at 286 mu and 262 mu. (Author)

PB 153 981 $4.60

Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATION OF NEAR ULTRAVIOLET TRANSMITTING LIQUIDS FOR USE AS KERR CELL FLUIDS IN TRANSIENT SPECTROGRAPHIC SHUTTERS, by S.M. Hauser and F. R. Marshall. Rept. on Research on Particle Dynamics, Contract AF 33(616)6669. Jan 61, 48p. 14 refs. ARL-3.

DESCRIPTORS: *Photoelectric shutters, Liquids, *Ultraviolet optical materials, Dielectric properties, Relaxation time, Molecules, Organic materials, Measurement, Electron optics.

A number of liquids were investigated for use as near ultraviolet Kerr cell working fluids for high-speed electro-optical shutters. Measurements were made of the spectral transmittance, Kerr constant, static dielectric constant, and molecular relaxation times for 12 liquids, all of which have Kerr constants within 1/8 of that for nitrobenzene, including 6 liquids which were not investigated previously with respect to their Kerr constants. Benzonitrile was found to have the largest Kerr constant of any near ultraviolet transmitting room-temperature liquid previously reported. A simple technique is described which permits determination of molecular relaxation times by means of measurements at frequencies well below the so-called anomalous dispersion frequencies characteristic of small polar organic molecules. An electro-optical high-speed shutter system designed specifically for use with an f/24 Bausch and Lomb spectrograph is described. The shutter assembly employs a pair of Kerr cell shutters and two pairs of Glan air-spaced polarizers to provide an open-to-closed transmission ratio of 10 to the 8th power over an optical bandwidth extending from about 3000 A to well over 10,000 A. (Author)

PB 155 488 $3.60

Stanford Research Inst., Menlo Park, Calif.
SPECIALTY SILICONE ELASTOMERS, by S. A. Fuqua R. M. Parkhurst and R. M. Silverstein. Interim technical rept. no. 1 (Rept. no. 18) on Contract DA 11-070-508-ORD-906. 2 Feb 61, 38p. 16 refs. AD-252 613

DESCRIPTORS: *Elastomers, *Silicones, Preparation, Polymerization, Synthesis, *Fluorides, Silanes, Bromine compounds, Bromides, Hydrolysis, Phenyl radicals.

Preparation and polymerization of α, ω-bis-(p-(ethoxydimethylsilyl)phenyl) per fluoroalkanes were studied. Synthesis of the intermediate α,ω-bis-(bromophenyl)perfluoroalkanes is reported. Conversion of the dibromo compounds to the silanes was investigated, using the preparation of 1,4-bis-(ethoxydimethylsilyl)-benzene and bis-(p-ethoxdimethylsilyl)phenyl ether as models. Modifications were necessary when applying these results to synthesis of the fluorinated silanes. (Author)

PB 155 131 $4.60

Trinity Coll., Dublin (Eire).
AN INVESTIGATION OF CERTAIN WEST INDIAN HARDWOODS, NAMELY ANDIRA INERMIS, TABEBUIA PENTAPHLLA, COPAIFERA OFFICINALIS, by Wesley Cocker. Final technical rept. no. 1, 1 Feb 60-31 Jan 61, on Contract DA 91-591-EUC-1375. Feb 61, 46p. 24 refs. AD-252 823.

DESCRIPTORS: *Wood, Caribbean Islands, Chemical analysis, Chemicals.

The following woods, collected from the West Indies, have been investigated: Andira inermis, Tabebuia pentaphylla, Copaifera officinalis, Manilkara bidentata, and Simaruba amara. Although only the first three woods strictly come within the ambit of the contract, it was felt that until larger quantities of these woods become available the work should be pressed forward on a wider front. The woods were extracted successively with light petroleum and then acetone. In some cases ether and methanol in this order were interposed as solvents between the light petroleum and the acetone. Only Andira inermis has so far yielded any new compound. (Author)

Ceramics and Refractories

ANL-6168 $0.50

Argonne National Lab., Ill
THE ZrO_2-CaO-UO_2 CERAMIC FUEL FABRICATION FOR THE EBWR SPIKED CORE ELEMENTS, by R. C. Lied, E. D. Lynch, and J. H. Handwerk. Final rept. on Contract W-31-109-eng-38. May 61, 17p.

PB 155 937 $1.10

General Electric Co., Cincinnati, Ohio.
THE EFFECT OF ARC PLASMA DEPOSITION ON THE STABILITY OF NON-METALLIC MATERIALS, by B. E. Kramer and M. A. Levinstein. Bimonthly rept. no. 2 on Contract NOa(s) 60-6076-c. 3 Aug 60, 9p. Rept. no. DM 60-174; AD-240 700.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Flame spraying, *Refractory materials, *Ceramic materials, Carbides, Oxides, Nitrides, Borides, Plasma physics, Ceramic coatings, Refractory coatings.

High-melting-point carbides, oxides, nitrides, and borides were flame sprayed with a plasma jet spray gun. Chemical and crystallographic analyses were made to determine the stability of the materials. Ti was found to be an excellent substrate material; it has a relatively high melting point and high heat capacity; the oxides and nitrides adhere very well to Ti. After deposition of a coating onto a titanium panel, it was removed by bending the panel. Separation of a coating from Ti usually occurs by fracture within the coating, indicating that the bond strength exceeds the cohesive strength of the coating material. TiN sprayed in air was deposited as TiO_2. When sprayed in an atmosphere of N with an N-H plasma forming gas, TiN, slightly deficient in N, was deposited. ZrB_2 adhered exceptionally well to both graphite and Ti. Generally, the oxides do not decompose or react with the plasma gases. Deposits of Cr_2O_3 were poor in quality. Good deposits of ZrO_2 were obtained by using a short gun-to-work distance (1 to 1 1/2 in.), but the ZrO_2 deposits were laminated.

PB 150 117 $2.60

General Electric Research Lab., Schenectady, N. Y.
LOW-TEMPERATURE BRITTLENESS OF REFRACTORY METALS, by H. W. Schadler and J. R. Low, Jr. Annual Summary rept. no. II, 31 July 59-31 July 60, on Contract Nonr-2614(00). Aug 60, 27p. 18 refs. 60-GC-124; AD-244 702.

DESCRIPTORS: *Tungsten, *Single crystals (Metallurgy), Crystallization, Growth, Hardness, Heat treatment, Fracture (Mechanics), Microstructure, *Refractory materials, Metallic crystals.

The recrystallization characteristics were studied of cold-rolled tungsten single crystals produced by electron bombardment floating zone refining. Tungsten crystals of various orientations were rolled to 44, 70, 76, and 85% reduction in area at 450° and 400°C and annealed at 600° to 1600°C. The annealed specimens were examined for recrystallization and hardness. Consideration is given to the results from several methods of cold rolling. Studies indicated difficulty in obtaining very fine grained material or a large variation in grain size for heat treatments of samples cold-rolled to less than 85% reduction in area at temperatures below 1600°C. Experiments concerning the brittle fracture in tungsten indicated that grain boundaries are important to the initiation of fracture in high-purity tungsten, that twinning plays a role in the propagation of brittle cracks, and that twins may initiate brittle fracture. Requirements are listed which can be used to determine the reliability of the etching-pitting technique in revealing dislocations. Attempts to measure average dislocation velocities in tungsten single crystals were unsuccessful. The strain rate sensitivity of tungsten single crystals having different orientations was measured at 298° and 77°K for strains from about 1 to 10%. The strain rate was varied by a factor of 10 from 0.4 to 4.0%/min. The data were scattered so that it was not possible to attribute any effect of strain or crystal orientation. However, there was considerable temperature effect.

GEAP-3626 $0.50

Vallecitos Atomic Lab., Pleasanton, Calif.
METALLOGRAPHY OF THE BORIDES, by D. R. Lewis. Technical rept. on Contract AT(04-3)-189. 9 Jan 61, 18p.

Fuels, Lubricants, and Hydraulic Fluids

PB 157 074 $2.60

AeroChem Research Labs., Inc., Princeton, N. J.
STUDY OF ADDITIVE EFFECTS IN SOLID PROPELLANT BURNING, by H. Burwasser, H. F. Calcote, and H. Silla. Quarterly progress rept. no. 3 on Contract Nonr-2806(00). Feb 60, 24p. 6 refs. Technical memo. no. 20; AD-236 243.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Solid rocket propellants, *Combustion, *Fuel additives, Rocket oxidizers, Oxygen, Perchloryl radicals, Fluorides, Ammonium radicals, Perchlorates, Esters, Polymers, Styrenes.

Attention has been given to the oxygen effect reported previously. It has been demonstrated that it is not due simply to increasing the oxidizer-fuel ratio. By burning stoichiometric propellants in oxygen containing atmospheres -- the same increased burning rate was observed. That "tilt" burning, i.e., burning down the side of the strand, thus increasing the burning surface area, is not the cause is also demonstrated. Perchlorylfluoride is shown to have a somewhat greater effect than oxygen. Preliminary experiments are presented showing the same oxygen effect at subatmospheric pressures. The results are interpreted in terms of the chemical state of the oxidizer gas from the propellant which is consistent with decomposition studies of ammonium perchlorate and with combustion studies in nitrogen oxide atmospheres. The effect of fifteen solid additives on the burning rate was determined at one atmosphere for the same NH_4ClO_4-polyester-styrene propellant. (Author) (See also PB 155 706)

PB 171 914 $1.00

NonMetallic Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
A BENCH SCALE METHOD FOR DETERMINING PERFORMANCE CHARACTERISTICS OF LUBRICANTS IN AN OXIDATIVE ENVIRONMENT AT HIGH TEMPERATURES, by Samuel B. Schexnailder. Rept. for Jan-July 60 on Aviation Lubricants. Dec 60, 37p. 1 ref. WADD Technical rept. 60-794.

DESCRIPTORS: *Lubricants, Oils, Physical properties, Chemical properties, Test methods, Oxidation, Temperature.

An effective bench scale method for determining physical and chemical characteristics of lubricants subjected to high temperatures in oxidizing environments is described herein. The apparatus employed is sufficiently simple and economical for even the smallest research facility. However the methods developed and described herein are applicable for large scale programs. Data obtained from its use can be readily interpreted to indicate probable performance of experimental fluids and lubricants under the specific conditions used in the screening program. (Author)

PB 156 757 $2.60

Olin Mathieson Chemical Corp., New Haven, Conn.
RESEARCH AND DEVELOPMENT OF THE BALLISTIC BOMB AS A TOOL FOR DETERMINING EXPERIMENTAL PERFORMANCE OF LIQUID AND SOLID ROCKET PROPELLANTS, by G. T. Angeloff. Quarterly progress rept. no. 1 on Contract AF 33(616)5846. 1 Sep 58, 21p. AD-209 116.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Solid rocket propellants, *Liquid rocket propellants, Nitro radicals, Methanes, Pressure gages, Specific impulse, Combustion chambers.

The ballistic bomb which had been fabricated previously was inspected and restored to service. Calibration of a new pressure transducer was completed and a copper-crusher gauge holder was designed and fabricated. Re-evaluation of the specific impulse of nitromethane and isopropyl nitrate was completed and an attempt was made to evaluate unsymmetrical dimethyl hydrazine. (Author)

PB 156 758 $1.60

Olin Mathieson Chemical Corp., New Haven, Conn.
RESEARCH AND DEVELOPMENT OF THE BALLISTIC BOMB AS A TOOL FOR DETERMINING EXPERIMENTAL PERFORMANCE OF LIQUID AND SOLID ROCKET PROPELLANTS, by G. T. Angeloff. Quarterly progress rept. no. 2, 1 Sep-30 Nov 58, on Contract AF 33(616)5846. 1 Dec 58, 16p. 2 refs. AD-211 140.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Liquid rocket propellants, *Solid rocket propellants, Specific impulse, Nitro radicals, Methanes, Pressure gages, *Combustion chambers.

A new bomb and copper-crusher gauge holder was delivered and calibrated. Evaluation of the specific impulse of ethyl-propyl nitrate (60-40), Isolde, and mixtures of hydrazine with varying percentages of hydrazine nitrate was completed, and studies were also made to determine the effect of ignition rise-time on peak pressure and its reproducibility. (Author) (See also PB 156 757)

PB 156 759 $1.10

Olin Mathieson Chemical Corp., New Haven, Conn.
RESEARCH AND DEVELOPMENT OF THE BALLISTIC BOMB AS A TOOL FOR DETERMINING EXPERIMENTAL PERFORMANCE OF LIQUID AND SOLID ROCKET PROPELLANTS, by G. T. Angeloff. Quarterly progress rept. no. 3, 1 Dec 58-28 Feb 59, on Contract AF 33(616)5846. 1 Mar 59, 9p. AD-215 313.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Liquid rocket propellants, *Solid rocket propellants, Hydrogen compounds, Peroxides, *Combustion chambers, Pressure gages, Specific impulse, Ammonium radicals, Nitrates.

Determination of the specific impulse of hydrogen peroxide was attempted. A booster was added to the existing ignitor and used to re-evaluate isopropyl nitrate to determine the effect of the booster rise-time on peak-pressure reproducibility, and the evaluation of certain solid propellant types was begun. (Author) (See also PB 156 758)

PB 156 760 $2.60

Olin Mathieson Chemical Corp., New Haven, Conn.
RESEARCH AND DEVELOPMENT OF THE BALLISTIC BOMB AS A TOOL FOR DETERMINING EXPERIMENTAL PERFORMANCE OF LIQUID AND SOLID ROCKET PROPELLANTS, by G. T. Angeloff. Quarterly progress rept. no. 4, 1 Mar-31 May 59, on Contract AF 33(616)5846. 1 June 59, 18p. 2 refs. AD-220 072.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Liquid rocket propellants, *Solid rocket propellants, *Combustion chambers, Pressure gages, Hydrogen compounds, Peroxides, Acetylenes, Specific impulse, Ethylene oxide, Combustion chamber liners.

Design Studies: The testing of an NH_4ClO_4-type solid propellant in a ballistic bomb, produced fine hairline cracks in the combustion chamber walls. The cracks were due to the chamber pressure and high flame temperature of the solid propellant. This deterioration of the combustion chamber walls of 17-4PH stainless steel indicated that the ballistic bomb, or at least the chamber, should be made of a better heat- and pressure-resistant steel. The ballistic bomb is being redesigned to include an oxidizer plenum chamber, end fittings with a 29^{O} Acme thread, trunnion bearing mount, and a liner of a suitable material which will facilitate the evaluation of higher flame temperature propellants. Evaluation: Evaluations of ethylene oxide and isopropenyl acetylene gave specific impulses of 88 and 82% of the reported theoretical values, respectively. Manganese dioxide and Ca permanganate were used as auxiliary

compounds in the evaluation of 98% H_2O_2; specific impulse values of 102% and 97% of theoretical were obtained respectively. Instrumentation: Examination of the recording instrumentation revealed a faulty vertical amplifier in the oscilloscope. This was corrected for the 98% H_2O_2 series. (See also PB 156 759)

PB 156 761 $1.60

Olin Mathieson Chemical Corp., New Haven, Conn.
RESEARCH AND DEVELOPMENT OF THE BALLISTIC BOMB AS A TOOL FOR DETERMINING EXPERIMENTAL PERFORMANCE OF LIQUID AND SOLID ROCKET PROPELLANTS, by G. T. Angeloff. Quarterly progress rept. no. 5, 1 June-31 Aug 59, on Contract AF 33(616)5846. 1 Sep 59, 13p. 2 refs. AD-226 841.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Liquid rocket propellants. *Solid rocket propellants, *Combustion chambers, Pressure gages, Specific impulse, Acetylenes, Hydrogen compounds, Peroxides, Nitro radicals, Methanes, Ammonium radicals, Perchlorates.

Chamber liner: A combustion chamber liner of Haynes alloy no. 25 was fabricated and pressfitted into the ballistic bomb. The bomb was first calibrated with nitromethane. A specific impulse of 214 sec was obtained; this was 99% of the theoretical density. A specific impulse of 222 sec, 95% of theoretical impulse, was recorded when an NH_4ClO_4 solid propellant was tested in the ballistic bomb. Relationship of propellant charge to igniter: A specific impulse value of 2% higher than the reported theoretical value was obtained with isopropenyl acetylene; the bomb was in the vertical position and the standard 20 mm cannon primer was the lone igniter. Again with the bomb vertically positioned and the 20 mm cannon primer as the igniter, a specific impulse value of 94% theoretical value was obtained with the use of 90% H_2O_2. (See also PB 156 760)

PB 156 762 $1.10

Olin Mathieson Chemical Corp., New Haven, Conn.
RESEARCH AND DEVELOPMENT OF THE BALLISTIC BOMB AS A TOOL FOR DETERMINING EXPERIMENTAL PERFORMANCE OF LIQUID AND SOLID ROCKET PROPELLANTS, by G. T. Angeloff. Quarterly progress rept. no. 6, 1 Sep-30 Nov 59, on Contract AF 33(616)5846. 1 Dec 59, 10p. 1 ref. AD-230 762.

This report released for sale to the public 20 July 61.

DESCRIPTORS: Specific impulse, *Combustion chambers, Pressure gages, Liquid rocket propellants, Ammonium radicals, Perchlorates, Hydrogen compounds, *Solid rocket propellants, Peroxides, Acetylenes, Nitro radicals, Methanes.

The combustion liner was press-fitted, aligned, and anchored in the ballistic bomb by a set screw. Two solid-type propellants were tested in the ballistic bomb. The ammonium perchlorate double base propellant had a specific impulse of 234 sec at 1000 psi. The nitrocellulose nitroglycerin double base propellant had a specific impulse of 207 sec at 1000 psi. A hard ceramic-type coating was deposited on the chamber walls and fittings during the firings but was easily cleaned off. A polyethylene disk 0.003-in. thick was used to seal the oxidizer chamber; the disk ruptured at 150 psi of pressure. The bipropellant combination of RFNA and anhydrous hydrazine at a mixture ratio of 1.57 (stoichiometric) was first used to evaluate the bomb. The peak chamber pressure reached was only about 5% higher than that which hydrazine alone produced as a monopropellant at equal loading densities. Hydrazine was placed in the oxidizer chamber and the oxidizer in the combustion chamber. This technique resulted in higher peak-pressures but the PV vs P did not result in a straight line which is necessary in order to carry out the method and extrapolate to zero pressure. (See also PB 156 761)

MATHEMATICS

PB 150 950 $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A COMPARISON OF THE MEANING AND USES OF MODELS IN MATHEMATICS AND THE EMPIRICAL SCIENCES, by Patrick Suppes. Technical rept. no. 33 on Contract Nonr-225(17). 25 Aug 60, 23p. 17 refs. AD-243 252.

DESCRIPTORS: *Learning, Mathematical analysis, *Mathematical logic, Theory.

PB 150 761 $5.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ESTIMATING THE INFINITESIMAL GENERATOR OF A CONTINUOUS TIME, FINITE STATE MARKOV PROCESS, by Arthur Albert. Technical rept. no. 60 on Contract Nonr-225(52). 31 Aug 60, 58p. 6 refs. AD-242 992.

DESCRIPTORS: *Statistical processes, *Matrix algebra, Probability, Distribution theory.

Let $\{Z(t), t>0\}$ be a separable, continuous time Markov Process with stationary transition probabilities $P_{ij}(t)$, i, j = 1, 2, ..., M. Under suitable regularity conditions, the matrix of transition probabilities, P(t), can be expressed in the form $P(t) = \exp tQ$, where Q is an M x M matrix and is called the infinitesimal generator for the process. A density on the space of sample functions over [O, t) is constructed. This density depends upon Q. If Q is unknown, the maximum likelihood estimate $Q'(k,t) = ||q'_{ij}(k,t)||$, based upon k independent realizations of the process over [O,t), can be derived. If each state has positive probability of being occupied during [O,t) and if the number of independent observations, k, grows large (t held fixed), then q'_{ij} is strongly consistent, and the joint distribution of the set $\{\sqrt{k}\,(q'_{ij} - q_{ij})\}$ $i \neq j$ (suitably normalized) is asymptotically normal with zero mean and covariance equal to the identity matrix. If k is held fixed and if t grows large, then q'_{ij} is again strongly consistent, and the joint distribution of the set $\{\sqrt{t}\,(q'_{ij})\}$ $i \neq j$ (suitably normalized) is asymptotically normal with zero mean and covariance equal to the identity matrix, provided that the process

$\{Z(t), t > 0\}$ is positively regular. The asymptotic variances of the q_{ij} are computed in both cases. (Author)

PB 150 759 $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
MULTIVARIATE CORRELATION MODELS WITH MIXED DISCRETE AND CONTINUOUS VARIABLES, by I. Olkin and R. F. Tate. Technical rept. no. 58 on Contract Nonr-225(52). 23 Aug 60, 36p. 15 refs. AD-242 990.

DESCRIPTORS: *Statistical distributions, Statistical functions, Vector analysis, *Psychology, Experimental data, Statistical analysis.

A multivariate extension is considered in which $x = (x_0, x_1, \ldots, x_k)$ has a multinomial distribution, and the conditional distribution of $y = (y_1, \ldots, y_p)$ for fixed x is multivariate normal. (Author)

PB 155 508 $11.00

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON WEAK COMPLETENESS OF INTUITIONISTIC PREDICATE LOGIC (I). ANALYSIS OF BETH'S SEMANTIC CONSTRUCTION OF INTUITIONISTIC LOGIC (II). NOTE ON COMPLETENESS AND DEFINABILITY (III) by G. Kreisel and V. H. Dyson. Technical rept. no. 3 on Contract DA 04-200-ORD-997. 27 Jan 61, 142p. 34 refs. OOR repts. 2379:3-M, 2379:4-M and 2379:5-M; AD-252 455.

DESCRIPTORS: *Mathematical logic, Analysis.

PB 150 387 $1.60

Applied Mathematics and Statistics Labs., Sanford U., Calif.
A PROPOSAL OF MARRIAGE OF THE PURE AND APPLIED POINTS OF VIEW ESPECIALLY IN THE STUDY OF ORDINARY DIFFERENTIAL EQUATIONS, by T. E. Hull (U. of British Columbia) Technical rept. no. 6 on Contract Nonr-225(37). 8 Aug 60, 16p. 7 refs. AD-242 172.

DESCRIPTORS: *Differential equations, Training, Theory.

A brief summary is presented of a treatment of ordinary differential equations which combines the point of view of the pure mathematician interested in existence theorems with that of the applied mathematician interested in numerical calculations. The numerical methods were introduced in a completely natural and general way. An advantage of using realistic numerical procedures in the proof of an existence theorem is that the convergence of the numerical procedure is established at the same time. In the case of multi-step methods, it is important to know which methods converge and which do not.

PB 150 115 $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A REMARK ON POTENTIAL THEORY AND SCHAUDER ESTIMATES, by Paul Fife. Technical rept. no. 91 on Contract Nonr-225(11). 5 Aug 60, 26p. 6 refs. AD-241 389.

DESCRIPTORS: Parial differential equations, *Potential theory.

Conditions on the kernel K in the equation $u(x) = \int K(x, y)\, g(y)\, dy$ are given under which estimates on the Hölder difference quotients of u are obtainable even when the usual Hölder continuity assumption on g is relaxed to a certain extent; namely to the extent that g(x) need be Hölder continuous only with respect to certain of the components x_i. A consequence of this is that Schauder estimates for solutions to general elliptic boundary value problems are still obtainable when the Hölder continuity assumptions on the solution and inhomogeneous terms of the equation are relaxed in a similar fashion. Also some existence and uniqueness theorems involving Hölder continuity assumptions are still valid when the assumptions are relaxed in this way. (Author)

PB 150 760 $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
SEQUENTIAL TESTS FOR THE MEAN OF A NORMAL DISTRIBUTION, by Herman Chernoff. Technical rept. no. 59 on Contract Nonr-225(52). 26 Aug 60, 27p. 16 refs. AD-242 991.

DESCRIPTORS: *Statistical tests, *Statistical distributions, Sequential analysis; Statistical processes.

The problem of sequentially testing whether the drift of a Wiener process is positive or negative, given an a priori normal distribution, is reduced to the solution of a free boundary problem involving a diffusion equation. (Author)

PB 154 795 $1.10

Applied Mathematics and Statistics Labs., Stanford U., Calif.
TESTING THE HYPOTHESIS THAT A REGRESSION SURFACE REMAINS CONSTANT THROUGH TIME, by J. Durbin, London School of Economics. Technical rept. no. 5 on Grant DA-ORD-43. 26 Sep 60, 9p. 4 refs. OOR rept. 2025:5-M: AD-247 261.

DESCRIPTORS: *Statistical tests, Statistical analysis, Matrix algebra.

A simple exact procedure based on the Kolmogrov goodness-of-fit test is presented for testing the hypothesis that the parameters of a regression model remain constant through time against the alternative that at an unknown time during the period they change to different values. A method is developed for the general case of a multiple regression on independent variables.

PB 155 493 $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
AN EXPONOMIAL EXTRAPOLATOR, by R. J. Duffin and Phillip Whidden. Technical rept. no. 46 on Mathematical Analysis of Electrical and Mathematical Systems, Contract DA 36-061-ORD-490. 12 Dec 60, 18p. 1 ref. CIT-ORD-6D-TR 46; OOR rept. 223:51-M; AD-252 482.

DESCRIPTORS: *Special functions, Mathematical prediction, Series, Theory.

A linear combination of m exponential functions (exponomial) is fitted to a time series, such as daily observations. The fitting is carried out over all past time by weighted least square with an exponential weight factor. The resulting minimizing function could be continued into the future. In particular tomorrow's predicted value is defined by this continuation. To obtain an explicit solution of the problem a formula is constructed which gives the predicted value as a linear combination of the last m observed values and the last m predicted values. The 2m coefficients of this formula are expressed as explicit rational functions of the m exponential bases. The extrapolating functions available with this method include polynomials, trigonometric polynomials, damped waves, etc. The particular class of extrapolating functions to be used for a given problem depends on the genesis of the data. (Author)

PB 155 494 $1.10

Carnegie Inst. of Tech., Pittsburgh, Pa.
ORTHOGONAL SAW-TOOTH FUNCTIONS, by R. J. Duffin. Technical rept. no. 48 on Mathematical Analysis of Electrical and Mechanical Systems, Contract DA 36-061-ORD-490. 29 Dec 60, 7p. 3 refs. CIT-ORD-6D-TR48; OOR rept. 223:52-M; AD-252 483.

DESCRIPTORS: *Functions, Analysis.

Harrington and Cell have recently defined an interesting set of square-wave functions. They have studied the properties of this set of functions and have shown them to be orthogonal and complete on L_2. This note carries out a similar study but starts with a saw-tooth wave rather than a square wave. (Author)

PB 155 389 $2.60

Case Inst. of Tech., Cleveland, Ohio.
FOLDED NORMAL II. COMPARISON OF TWO METHODS OF ESTIMATING PARAMETERS FROM MOMENTS, by Regina C. Elandt. Rept. on Contract AF 49(638)361. Feb 61, 21p. 2 refs. Case Statistical Lab. Pub. no. 1042; AFOSR-393; AD-253 245.

DESCRIPTORS: Probability, Statistical functions, *Distribution theory, *Industrial research.

The general formula for the r to the n power moment of the folded normal distribution is obtained, and formulae for the first four noncentral and central moments are calculated explicitly. To illustrate the mode of convergence of the folded normal to the normal distribution, as $\mu/\sigma = \theta$ increases, the shape factors β_{f1} and β_{f2} were calculated and the relationship between them represented graphically. Two methods, one using first and second moments and the other using second and fourth moments of estimating the parameters μ and σ of the parent normal distribution are presented and their standard errors calculated. The accuracy of both methods, for various values of θ are discussed. (Author)

PB 155 503 $1.60

Columbia U., New York.
THE RETURN PERIOD OF ORDER STATISTICS, by E. J Gumbel. Technical rept. T-21 on Contract DA 30-069-ORD-1061. [1960] 11p. 3 refs. CU-14-58-ORD-1061-IE OOR rept. 1716:15-E AD-248 239.

DESCRIPTORS: *Statistical analysis, Statistical functions, Probability, Sampling, Theory.

Suppose n independent observations ($n \geq z$) are made one at a time on a population with a continuous probability function F (x). Let x(m), m = 1, 2....n, be the observations arranged in decreasing order of magnitude; i.e., the order statistics. After this first sample of size n, the observations are continued one at a time until a value exceeding a specific x(m) is reached. Let N be the number of these further observations required; then N is a discontinuous random variable. The distribution of the conditional expectation of N is studied, given the observed mth order statistic x(m). The expectation is shown also to be infinite for the largest value and remains finite for $m \geq 1$. (Author)

PB 155 458 $2.60

Connecticut U. (Storrs).
ON TRANSLATION CONTINUITY AND TRIGONOMETRIC POLYNOMIALS, by Richard P. Gosselin. Technical note on Contract AF 49(638)608. Mar 61, 28p. 11 refs. AFOSR-390; AD-253 375.

DESCRIPTORS: *Trigonometry, *Polynomials, Integral equations, Functions.

The notion of translation continuity is introduced, and it is shown that if a certain integral involving the first difference of a function is finite, then the function is translation continuous almost everywhere. With the hypothesis of translation continuity, convergence theorems for sequences of trigonometric polynomials are proved. With the hypothesis of the finiteness of some integrals, further convergence theorems are proved. (Author)

PB 149 748 $5.60

[Illinois U., Urbana].
THE ANALOGUE OF THE PISOT-VIJAYARAGHAVAN NUMBERS IN FIELDS OF FORMAL POWER SERIES, by Alfred L. Duquette. Rept. on Contract Nonr-1834(18), 1960. 51p. 13 refs. AD-240 548.

DESCRIPTORS: *Number theory, Real variables; Complex numbers; *Algebra, Taylor's series, Series.

Contents:
Results for arbitrary base fields and for perfect base fields
Results for finite base fields
Results for denumerable base fields of characteristic zero

PB 155 512 $15.00

Institute of Tech., U. of Minnesota, Minneapolis.
GROUP THEORY AND DIFFERENTIAL EQUATIONS. LECTURE NOTES AT THE UNIVERSITY OF MINNESOTA 1959-1960, by Lawrence Markus. Technical rept. no. 4, July-Sep 60, on Problems in the Theory of Ordinary Differential and Difference Equations, Contract DA 11-022-ORD-3369. [1960] 229p. 46 refs. OOR rept. 2560:4-M; AD-251 444.

DESCRIPTORS: *Groups (Mathematics), Theory, *Differential equations, Algebra, *Transformations (Mathematics).

PB 154 789 $1.60

Iowa State U. of Science and Tech., Ames.
ALMOST PERIODIC SOLUTIONS OF DIFFERENTIAL EQUATIONS, by C. E. Langenhop. Final technical rept. 18 Dec 57-17 Dec 60, on Contract DA 11-022-ORD-2630. [1960] 20p. 15 refs. OOR rept. 1857:7-M; AD-250 486.

DESCRIPTORS: *Differential equations, Functions, Real variables.

A summary is presented of the study of almost periodic solutions of the differential equation $x'' + f(x,x')x'+g(x)$ equals $p(t)$, where $p(t)$ is almost periodic and x' is equal to dx/dt. Several byproducts pertaining to more general problems in the theory of differential equations were also obtained. (Author)

UCRL-9498 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
LINEAR PROGRAMMING APPLIED TO LINEAR DIFFERENTIAL EQUATIONS, by J. D. Young. Rept. on Contract W-7405-eng-48. 17 Jan 61, 10p.

PB 155 657 $1.60

Rice U., Houston, Tex.
MEROMORPHIC FUNCTIONS WITH SMALL CHARACTERISTIC AND NO ASYMPTOTIC VALUES, by Gerald R. MacLane. Technical note no. 3 on Contract AF 49(638)205. Feb 61, 17p. 6 refs. AFOSR-389; AD-253 921.

DESCRIPTORS: *Functions, *Taylor's series, *Surfaces.

By the results of Fatou and Nevalinna any function $F(z)$, meromorphic in $|z|<1$, with bounded characteristic has radial limits almost everywhere. Lohwater and Piranian (Ann. Acad. Sci. Fenn. AI 239, 1957) have constructed an $F(z)$ without radial limits and such that $T(r) = O(-\log(1-r))$. The object here is to prove: let $p(r)$ be a given function in $[0, 1)$, $0 < p(r) \uparrow \infty$. Then there exists a function $F(z)$, meromorphic in $|z| < 1$, such that $T(r, F) \leq p(r)$ and such that if C is any continuous curve in $|z| < 1$, tending to $|z| = 1$, then the image of C by F is dense on the sphere. In particular, then, $F(z)$ has no radial limits. The construction is of the form $F(z) = \mathcal{G}(f(z))$ where: (1) $f(z)$ is holomorphic in $|z| < 1$, of slow growth, and assumes arbitrarily large values on any curve tending to $|z| = 1$. f is constructed as a gap Taylor series, similar to the example of Lusin and Priwaloff (Ann. l'École Norm. Sup. 1925, 147-150); (2) $\mathcal{G}(z)$ is meromorphic in $|z| < \infty$, of known growth, and such that the image by $\mathcal{G}$ of any unbounded curve in $|z| < \infty$ is dense on the sphere. $\mathcal{G}$ is constructed by specifying the Riemann surface of its inverse as a covering of the sphere. (Author)

PB 150 137 $1.60

Rutgers State U., New Brunswick, N. J.
THE MOMENTS OF THE NON-CENTRAL t-DISTRIBUTION, by D. Hogben, R. S. Pinkham, and M. B. Wilk. Technical rept. no. N-2 on Contract Nonr-404(16). Aug 60, 19p. 6 refs. AD-242 467.

DESCRIPTORS: *Statistical distributions, Functions, Tables, Analysis of variance, Series.

A procedure for finding simple explicit expressions for the raw moments of the non-central t-distribution is presented. Tables of numerical values relevant to the first four central moments and cumulants are given. Application of the tables is illustrated in finding the approximate values of the expectation of certain functions of the non-central t-distribution. (Author)

PB 155 513 $2.60

Syracuse U., N. Y.
S-SPACES AND THE OPEN MAPPING THEOREM, by Taqdir Husain. Doctoral thesis. Technical rept. 1 on Topological Vector Spaces, Contract DA 30-069-ORD-3068. Dec 60, 27p. 22 refs. OOR rept. 2653:1-M; AD-250 339.

DESCRIPTORS: *Topology, Convex sets, Theory.

Let e-w* denote the finest topology which coincides with the weak* topology $+(E', E)$ on each equicontinuous set of the dual E' of a locally convex (l.c) linear space E and let P denote the uniform convergence topology over precompact (totally bounded) sets of E on E'. An l.c, space E is called an S-space if on its dual E', the topologies e-w* and P are equal. S-spaces are a proper generalization of metriable l.c. spaces. The important theorems like the open mapping, the closed graph, and the Krein Smulian Theorems, which are known to be true for Frechet spaces, are carried over to complete S-spaces. The completion of an S-space is an S-space and B-complete. As regards the structure of S-spaces, the closed subspace of a complete S-space is proved to be also of a complete S-space. The strict inductive limit, and the countable direct sum of complete S-spaces is also a complete S-space provided the dual, in each case, endowed with R-topology is bornological where R is the Mackey topology associated with P. (Author)

PB 154 794 $2.60

Virginia Agricultural Experiment Station, Blacksburg.
THE ANALYSIS OF PAIRED-COMPARISON EXPERIMENTS INVOLVING TIES, by Shiu-Hon Wong and W. A. Glenn. Technical rept. no. 40 on Research on

Order Statistics and the Design of Experiments, Contract DA 36-034-ORD-1527. Nov 60, 28p. 2 refs. OOR rept. 1166:54-M; AD-250 345.

DESCRIPTORS: *Programming, *Least squares method, Food, Tests, Test methods, Statistical processes.

A recently proposed modification of the Thurstone-Mosteller method of paired comparisons makes possible the analysis of data involving ties of observations. The basis of the modification is the assumption that whenever the difference between his responses to two stimuli under comparison lies below a certain threshold, the judge will declare a tie. This threshold and the mean stimulus responses are estimated by least squares. This paper presents programs which are presented for the IBM 650 for analyzing paired-comparison data and for studying related questions. (Author)

Computing Devices

PB 149 851 $1.10

California U., Los Angeles.
ORGANIZATION OF COMPUTER SYSTEMS -- THE FIXED PLUS VARIABLE STRUCTURE COMPUTER, by Gerald Estrin. Rept. on Contract Nonr-233(52). [1960] 8p. 17 refs. AD-240 399.

DESCRIPTORS: *Digital computers, Design, Digital systems, Scientific organization.

Aspects of digital technology related to extending the bounds of practicable computability are characterized. A new concept of computer system organization is proposed.

PB 156 872 $2.60

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
GENERAL EXPONENTIAL FORECASTING: A COMPUTER PROGRAM FOR THE IBM 650, by Peter R. Winters. ONR Research memo. no. 71 on Planning and Control of Industrial Operations, Contract Nonr-760(01). Aug 60, 25p. AD-249 552.

DESCRIPTORS: Computers, Data processing systems, *Programming, Mathematical prediction, Probability, *Digital computers.

The General Exponential Forecasting Program is a computer program written in FORTRAN and compiled for the IBM 650. Machine requirements include: the basic computer, index registers, and floating-point hardware. The following phases of the program are discussed; criteria of prediction accuracy, standard deviations of forecast errors and coefficients of variation, options, data input, data restrictions, output, flow chart, variable dictionary, and program listing.

GAT-297 $0.50

Goodyear Atomic Corp., Portsmouth, Ohio.
INCREMENTAL POWER DEMAND COMPUTER, by R. F. Roe, R. L. Farr, and H. Steinhauer. Rept. on Contract AT(33-2)-1. 1 Dec 60, 15p.

PB 150 112 $1.60

Hermes Electronics Co., Cambridge, Mass.
MAJORITY LOGIC ANALYSIS, by R. Miller. Rept. on Contract Nonr-2133(00). 15 Aug 60, 20p. Publication #M-895; AD-242 606.

DESCRIPTORS: *Digital computers, *Digital systems, Reliability, Design, Mathematical analysis, Electronic circuits, Circuits, *Mathematical logic.

Consider a basic sequential digital system (one two-out-of-three gate on three functional units) with reliability P. Applying simple majority logic to the system gives reliability equations of the form: $R_m = GP^{\frac{2k}{n}}(3 - 2P^{\frac{n}{k}})^{\frac{k}{n}}$, where G is the reliability of a two-out-of-three majority gate. For preliminary analysis, no functional relation between P and G is assumed, although there may be similarities between components of the system and components of the majority gate. Let $\frac{k}{n} = \lambda$. The reliability equations become $R_m = \left[GP^{2\lambda}(3 - 2P^{\lambda})\right]^{\frac{1}{\lambda}}$. The term P^{λ}, representing the reliability of a discrete, single output bit processing component of the system, is called the building block reliability. The problem is to choose λ so that R_m is maximized. The actual system then has a compromise form with reliability given by the expression: $\left[GP^{2\lambda_i}(3 - 2P^{\lambda_i})\right]^s$, where s is an integer such that $\sum \lambda_i = 1$, $i = 1, \ldots, s$.

PB 157 019-1 $18.00

Melpar, Inc., Falls Church, Va.
AUTOMATIC DATA PROCESSING INPUT-OUTPUT EQUIPMENT STUDY. VOLUME I, by Joseph M. Van Horn, Farrel D. Peltz and others. Final rept. vol. 1, 1 June 58-31 July 59, on Contract DA 36-039-sc-78010. [1959] 285p. 1 ref. AD-235 251.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Data processing systems, Circuits, Design, *Military intelligence, Instrumentation, Armies, *Communication systems.

Included in the report is:
Thermoplastic recording, pub. in the Jnl. of Applied Physics 30:1870-1873, Dec 59.
The development of an integrated automatic data-processing system (ADPS) is investigated. Results are presented of a user-requirements survey to acquaint non-military personnel with the problems faced by modern field army, and military personnel with the applicability of automatic data processing to these problems. Techniques and equipment for the solution of these problems are also discussed.

PB 157 019-3 $9.60

Melpar, Inc., Falls Church, Va.
AUTOMATIC DATA PROCESSING INPUT-OUTPUT EQUIPMENT STUDY. VOLUME III, by Joseph M. Van Horn, Farrel D. Peltz and others. Final rept. vol. 3, 1 June 58-31 July 59, on Contract DA 36-039-sc-78010. [1959] 118p. 103 refs. AD-235 252.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Data processing systems, Circuits, Design, *Military intelligence, Instrumentation, Armies, *Communication systems, Bibliography.

The development of an integrated automatic data-processing system (ADPS) is continuing. The study includes a minimum family of input-output equipment for 1960-1965. Changes in the family for 1965-1970, possible adaption of commercial equipment to military usage, a survey of manufactures of commercial input-output equipment with tabulations of commercial equipment characteristics, and recommendations for development to complete FIELDATA equipment complement.

MECHANICS

PB 150 277 $1.60

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
BENDING VIBRATIONS OF UNIFORM TWISTED BEAMS, by Bernard Budiansky and R. C. DiPrima (Rensselaer Polytechnic Inst.). Technical rept. no. 8 on Contracts Nonr-1866(02) and Nonr-591(08). Aug 60, 17p. 5 refs. AD-243 975.

DESCRIPTORS: *Beams, *Vibration, Mathematical analysis, Determinants, *Mechanics.

Exact frequency equations for a variety of boundary conditions are obtained by the use of trigonometric series in conjunction with an appropriate variational principle. The success of the procedure used depends on a careful choice of series that preserves desirable orthogonality properties; this consideration is paramount and is adhered to without regard to term-by-term satisfaction of boundary conditions. Geometrical boundary conditions are subsequently imposed, when necessary, by the use of Lagrangian multipliers. (Author)

CEX-58.9 $1.25

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.
A MODEL DESIGNED TO PREDICT THE MOTION OF OBJECTS TRANSLATED BY CLASSICAL BLAST WAVES, by I. G. Bowen, R. W. Albright, and others. Jan 61, 55p.

PB 154 772 $12.00

Palermo U. (Italy).
LIMITING CONDITIONS OF YIELDING OF THICK-WALLED-CYLINDERS AND SPHERICAL-SHELLS, by Ferdinando Stassi-D'Alia. Final status rept. on Contract DA 91-591-EUC-1351. 24 Nov 59, 164p. 42 refs. AD-252 029.

DESCRIPTORS: *Cylindrical bodies, *Spheres, Mechanical properties, Plasticity, Theory, Elasticity, Pressure, Materials, Stresses, Bibliography, Italy, Structural shells, Mathematical analysis.

Contents:
The plastic state of matter and the limiting condition of yielding
Principles of the theory
The initial plastic state in thick-walled cylinders and spherical shells
The thick-walled cylinder in its initial plastic state by means of internal pressure
The cylinder in the initial plastic state owing to uniform pressure on the external wall
The spherical shell in its initial plastic state
Thick-walled cylinders and spherical shells in full plastic state
The hollow cylinder in full plastic state owing to internal or external pressure
The spherical shell in the total plastic state due to internal or external pressure
Thick-walled cylinders and spherical shells in the elasto-plastic state
The hollow cylinder in the elasto-plastic state
The hollow sphere in the elasto-plastic state

PB 156 890 $4.60

Polytechnic Inst. of Brooklyn, N. Y.
THE ANALYSIS OF THE GENERAL INSTABILITY OF RING REINFORCED CIRCULAR CYLINDRICAL SHELLS BY ORTHOTROPIC SHELL THEORY, by Sol R. Bodner. Doctoral thesis. Rept. on Contract N6onr-263(03). May 55, 46p. 13 refs. PIBAL rept. no. 291; AD-75 220.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Hydrostatic pressure, *Structures, Buckling, *Cylindrical bodies, Aircraft, Structural shells, Theory, Deformation, Fatigue (Mechanics)

The general instability load of a ring reinforced circular cylindrical shell under hydrostatic pressure is determined by analyzing an equivalent orthotropic shell. A set of differential equations for the stability of an orthotropic shell is derived. These equations are comparable in accuracy to those derived by Donnell for isotropic circular cylindrical shells. The orthotropic shell equations are solved for the case of a simply supported shell under hydrostatic pressure. The properties of the orthotropic shell are correlated to those of the ring reinforced shell to give the general instability load of the reinforced shell. This correlation involves the introduction of an effective length of sheet in bending and a semiempirical formula for that length is proposed. A procedure for determining the general instability load of a ring reinforced shell is outlined and some numerical examples and graphs of results are presented. (Author)

Aerodynamics and Pneumatics

PB 155 786 $1.60

Aeronautical Research Inst. of Sweden.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF SECOND-ORDER SUPERSONIC WING-BODY INTERFERENCE, FOR A NON-LIFTING BODY WITH WINGS AT INCIDENCE, by Peter G. Wilby. Technical note no. 4 on Contract AF 61(052)75. Oct 60, 14p. 4 refs. FFA rept. 87; AFOSR-419; AD-251 340.

DESCRIPTORS: *Supersonic flow, *Wing-body configurations, Pressure, Measurement, Theory, Interference, Wings, *Swept back wings, Supersonic airfoils.

Pressure distributions on the wing of two wing-body combinations were measured at Mach 3 and 4 with the wing at various incidences in the range 0 to 10 degrees. The results are compared with theoretical results which include interference effects calculated according to the second-order supersonic wing-body interference theory due to Landahl and Beane (J. Aero. Sci., 27: no. 694-702, Sep 60). This theory, having been tested previously for non-lifting wing-body combinations, is tested also for wings at incidence. The agreement between theory and experiment is found to vary with Mach number and wing sweepback. For the higher Mach number and moderate sweepback the theory gives a good prediction of pressure distribution, but for the most adverse condition of low Mach number and large sweepback the theory is found to overestimate the interference effects. An empirical guide to the limit of application of the interference theory is given. (Author)

PB 156 735 $4.60

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson Air Force Base, Ohio.
THE EFFECTS OF FLOW OBSTRUCTIONS ON AN OSCILLATING FREE CONVECTION BOUNDARY LAYER ON A HEATED VERTICAL PLATE, by Jack P. Holman, Kenneth E. Stout (Master's thesis) and Erich E. Soehngen, Rept. on Heat Transfer. Oct 60, 42p. 3 refs. WADD Technical note 60-24; AD-249 380.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Boundary layer, Sheets, *Gas flow, Convection, Stability, Oscillation, Damping, *Heat transfer.

The effects of three types of flow obstructions on artificially induced free convection boundary layer oscillations were measured with a Zehnder-Mach interferometer. The obstructions were: (1) a wedge, (2) a convex surface, and (3) a flat surface. It was found that the convex surface produced a slightly greater damping effect than the flat surface while both the convex surface and the flat surface produced considerably larger effects than the wedge. (Author)

PB 156 745 $16.00

Bell Aircraft Corp., Buffalo, N. Y.
STRUCTURAL DESIGN FOR AERODYNAMIC HEATING PART I: DESIGN INFORMATION, by W. H. Dukes and A. Schnitt. Final rept. on Construction Techniques and Application of New Materials, Contract AF 33(616)2581. Oct 55, declassified 1 Oct 58. 242p. 8 refs. WADC Technical rept. 55-305, Part I; AD-98 114.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Aerodynamic heating, Structures, Design, Materials, Physical properties.

The aerodynamic aspects of aerodynamic heating are explained for the structures engineer. Charts and nomographs facilitate the calculation of heat transfer coefficients, equilibrium temperatures, and associated functions to a velocity of 24,000 feet per second. Mechanical and physical property curves are presented for structural materials, as well as insulating and cooling materials for use at temperatures up to 2400°F. Other curves show thermal gradients and stresses developed in a T section structural element. These cover a wide range of aerodynamic and geometric parameters. Tables are included to show the strength of unstable structural elements for a range of materials and temperatures, both at short- and long-time loading. Temperature gradient effects in a column are also included. Design of pressure vessels is facilitated by tables that show weight and thickness, and by curves of buckling coefficients for vessels integral with the airframe. Design curves are given for various forms of structural insulation for both transient and steady-state conditions. (Author)

PB 154 793 $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
NOTE ON SHOCK PROPAGATION IN A NON-UNIFORM DUCT, by D. V. Ho. Technical rept. no. 4, Dec 60-Feb 61, on Structure and Analytic Treatment of Gas-Dynamical Wave Propagation with Entropy Variation, Contract DA 19-020-ORD-5126. Nov 60, 16p. 8 refs. Rept. DA-5126/4; OOR-2311:4-E; AD-250 315.

DESCRIPTORS: *Shock waves, Propagation, Ducts, Gas flow, Fluid flow, Fluid mechanics, Supersonic flow, Shock, Theory, Mathematical analysis.

This note concerns the propagation of spherical and cylindrical shocks, and more generally, of shocks in a duct of cross-sectional area varying along the duct. A non-dimensional wave strength relation is derived and shown to contribute to the elucidation of various approximation rules proposed by Chisnell, Whitham, Chester and Rosciszewski. (Author)

PB 150 465 $1.10

Brown U. Div. of Applied Mathematics, Providence, R. I.
NOTE ON SHOCK PROPAGATION IN A STRATIFIED ATMOSPHERE, by R. E. Meyer and D. V. Ho. Technical rept. no. 35 on Contract Nonr-562(07). Aug 60, 10p. 6 refs. 562(07)/35; AD-242 498.

DESCRIPTORS: *Shock waves, Propagation, Atmosphere, Density.

A locally exact wave strength relation is given for the propagation of a very strong plane shock into an atmospheric initially at rest, and some of its implications are discussed. It contributes to the elucidation of Whitham's (J. Fluid Mech. 4:337, 1958) rule and its background, and furnishes the first-order correction to that rule for the early stages of the motion in those cases where the rule is not initially exact. (Author)

PB 150 971 $3.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
SINGULARITIES IN THE HODOGRAPH PLANE ARISING FROM PROBLEMS OF FLOW PAST BODIES, by A. G. Mackie. Technical rept. no. 36 on Contract Nonr-562(07). Aug 60, 40p. 11 refs. 562(07)/36; AD-243 122.

DESCRIPTORS: *Numerical methods and procedures, *Transonics, *Subsonic flow, Gas flow, Aerodynamic configurations.

An investigation is carried out of the singularities which occur in the hodograph plane at the point corresponding to the point at infinity in the physical plane when a body is placed in an infinite two-dimensional stream. The primary aim is to identify these singularities for compressible fluids as the hodograph method offers one of the best methods of attack in the high subsonic and transonic regions. An examination is made of singularities in incompressible flow in which classes of exact solutions are known in both physical and hodograph planes. Analogous singularities are then identified for compressible flow. Considerable progress can be made in certain cases for gases with a general equation of state and this leads to the determination of a class of flows with free streamlines for this general fluid. In other cases the fundamental singularity can only be determined explicitly for a flow governed by the Tricomi equation for thin bodies in a near sonic stream. (Author)

PB 155 500 $6.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
KINETIC THEORY DESCRIPTION OF PLANE, COMPRESSIBLE COUETTE FLOW, by Lester Lees and Chung-yen Liu. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-1960. 15 Sep 60, 64p. 14 refs. Memo. no. 58; OOR rept. 1600:47-E; AD-248 354.

DESCRIPTORS: *Compressible flow, Theory, *Laminar boundary layer, *Fluid mechanics, Cylindrical bodies, Boundary layer, Partial differential equations, *Temperature, Heat transfer, Shear stresses, Gas flow, Simultaneous equations, Aerodynamics.

By utilizing the two-stream Maxwellian in Maxwell's integral equations of transfer, a closed-form solution is found of the problem of compressible plane Couette flow over the whole range of gas density from free molecule flow to atmospheric. The ratio of shear stress to the product of ordinary viscosity and velocity gradient, which is unity for a Newtonian fluid, depends on the gas density, the plate temperatures, and the plate spacing. For example, this ratio decreases rapidly with increasing plate Mach number when the plate temperatures are fixed. On the other hand, at a fixed Mach number based on the temperature of one plate, this ratio approaches unity as the temperature of the other plate increases. The effect of gas density on the skin friction and heat transfer coefficients is described in terms of a single rarefaction parameter, which amounts to evaluating gas properties at a certain kinetic temperature defined in terms of plate Mach number and plate temperature ratio. One interesting result is the effect of plate temperature on velocity slip. In the Navier-Stokes regime most of the gas follows the hot plate, because the gas viscosity is larger there. As the gas density decreases the situation is reversed, because the velocity slip is larger at the hot plate than at the cold plate. In the limiting case of a highly rarefied gas most of the gas follows the cold plate. (Author)

PB 155 499 $4.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
A STUDY OF AREA CHANGE NEAR THE DIAPHRAGM OF A SHOCK TUBE, by David A. Russell. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-1960. 20 July 60, 46p. 20 refs. Memo. no. 57; OOR rept. 1600:46-E; AD-248 353.

DESCRIPTORS: *Fluid flow, *Gas flow, Gases, *Shock tubes, *Shock waves, Theory, Pressure, *Nozzles, Aerodynamics.

The performance of a shock tube with area change near the diaphragm has been calculated for the high shock speed case by previous authors. This report extends the ideal theory calculations to include the whole shock speed range and all possible area changes near the diaphragm. Simple calculation procedures are presented and the practical applications of this type of area change are discussed. Experimental measurements show excellent agreement with the theory except for the intermediate shock speed range where a non-steady secondary shock wave is predicted. Here not only is the agreement with the basic performance curves marginal, but detailed observations revealed that no secondary normal shock is present. A new model is devised to explain these discrepancies. This new model takes frictional effects into account and shows promise of being useful for other shock tube problems. (Author)

PB 155 497 $4.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
USE OF FINE UNHEATED WIRES FOR HEAT TRANSFER MEASUREMENTS IN THE SHOCK TUBE, by Walter H. Christiansen. Rept. on Hypersonic Research Project, Contract DA 04-495-ORD-1960, 41p. 8 refs. Memo. no. 55; OOR rept. 1600:44-E; AD-248 351.

DESCRIPTORS: Tungsten wire, Shock waves, Gas flow, Gages, Hypersonic flow, Measurement, Platinum, *Shock tubes, *Wire, *Heat transfer, Instrumentation.

This report describes the application of fine cold wires for heat transfer measurements in the shock tube. The use of the calorimetric property of the wire results in a heat transfer instrument with an output of 0.25 mv/oC and a response lag of less than 1 Microsec. The gage construction, calibration, and response characteristics are discussed. Some preliminary results are also presented. (Author)

PB 150 865 $3.60

Mississippi State U., State College.
THE OSTIV CONGRESS AND WORLD SOARING CHAMPIONSHIP, by Dezso Gyorgyfalvy. Research note no. 10 on Contract Nonr-978(01). 11 Aug 60, 31p. AD-244 738.

DESCRIPTORS: *Gliders, *Aerodynamics, *Germany.

This report gives a resume' of the OSTIV Congress and makes some comments on the sailplanes of the Soaring Championship with particular respect to the technical evaluation of the latest development trends.

AD-255 530 repriced $1.00

National Aeronautics and Space Administration, Washington, D. C.
REGIME OF FROZEN BOUNDARY LAYERS IN STAGNATION REGION OF BLUNT REENTRY BODIES, by Norman T. Gri and Norman Sands. May 61. 37p. Technical note D-865.

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-865.

DESCRIPTORS: Hypersonic flow, *Superaerodynamics, Atmosphere entry, *Re-entry vehicles, Fluid mechanics, Recombination reactions, Blunt bodies, *Boundary layer.

The ratio of Damkohler number (average time a particle remains in the boundary layer to time required for atoms to recombine) to recombination rate constant was calculated assuming thermodynamic equilibrium exists outside the boundary layer. The results are presented for four altitudes between 150,000 and 300,000 ft, nose radii ranging from 1/2 to 10 ft, wall temperatures from 300 to 2000 K, free-stream velocities ranging from 12,000 to 26,000 fps, and values of the wall catalytic reaction rate constant of 0 and 300 cm/sec. Assuming a recombination rate constant of 10 to the 16th power cm to the 6th power squared (sec) and that frozen flow exists when the Damkohler number is less than 10 to the -2nd power, frozen flow exists for a nose radius of 1 ft and a wall temperature of 1000 K above altitudes of 200,000 ft and 260,000 ft for velocities of 12,000 and 26,000 fps, respectively. The ratio of the heat transferred to a noncatalytic wall surface to the heat transferred to a perfect catalytic wall surface with a wall temperature of 1000 K at an altitude of 246,060 ft was approximately 0.5 and 0.22 for velocities of 12,000 and 26,000 fps, respectively. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 150 506 $3.60

California Inst. of Tech., Pasadena.
THEORY OF GAS BUBBLE DYNAMICS IN OSCILLATING PRESSURE FIELDS, by Milton S. Plesset and Din-Yu Hsieh. Rept. on Contract Nonr-220(28). Aug 60, 33p. 6 refs. Engineering Div. rept. no. 85-16; AD-242 241.

DESCRIPTORS: *Bubbles, Gases, Fluids, Pressure, Oscillation, *Fluid mechanics, Thermodynamics, Dynamics, Theory.

The behavior of a permanent gas bubble in a liquid with an oscillating pressure field is analyzed with a linearized theory. If the assumption is made that conditions within the bubble are uniform, the thermodynamic relations found are as expected; i.e., at low frequencies the bubble behaves isothermally and at high frequencies the behavior becomes adiabatic. A more detailed analysis, which allows the bubble interior to vary not only in time but also in space, leads to an average isothermal behavior for the bubble even in the high frequency limit. (Author)

PB 150 505 $2.60

California Inst. of Tech., Pasadena.
THE THEORY OF RECTIFIED DIFFUSION OF MASS INTO GAS BUBBLES, by Din-Yu Hsieh and Milton S. Plesset. Rept. on Contract Nonr-220(28). Aug 60, 25p. 4 refs. Engineering Div. rept. no. 85-15; AD-242 240.

DESCRIPTORS: *Bubbles, Gases, Pressure, Oscillation, Diffusion, Theory, Liquids, *Cavitation, *Wave transmission, Ultrasonic radiation, Sound transmission

The behavior of a gas bubble in a liquid saturated with dissolved gas when oscillating pressures are imposed on the system is considered. This situation is encountered in experiments on cavitation and in the propagation of sonic and ultrasonic waves in liquids. Since gas diffuses into the bubble during the expansion half-cycle in which the pressure drops below its mean value, and diffuses out of the bubble during the compression half-cycle in which the pressure rises above its mean value, there is no net transfer of mass into or out of the bubble in first order. There is in second order a net inflow of gas into the bubble which is called rectified diffusion. The equations which determine the system include the equation of state of the gas in bubble, the equation of motion for the bubble boundary in the liquid, and the equation for the diffusion of dissolved gas in the liquid. The acoustic approximation is made; that is, the amplitude of the pressure oscillation is taken to be small. The assumption is made that the gas in the bubble remains isothermal throughout the oscillations; this assumption is valid provided the oscillation frequency is not too high. Under these conditions, an expression for the mean rate of gas flow into the bubble is found. The most important contribution to the rectification effect comes from the convection contribution to the diffusion process. (Author)

PB 157 075 $1.60

[Davidson Lab.] Stevens Inst. of Tech., Hoboken, N. J.
THE TWO-DIMENSIONAL WAKE AND DOWNWASH OF A HYDROFOIL IN WAVES, by Paul Kaplan. Rept. on Contract Nonr-263-01. Aug 53, declassified 2 Feb 55, 16p. 5 refs. Rept. no. 497; AD-18 509.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Hydrofoils, Wake, Downwash, Hydrodynamics, Water waves, Mathematical analysis.

The downwash angle and its rate of change with foil angle are derived for a hydrofoil moving under a free surface disturbed by sea waves. By means of a linearized analysis, the downwash and its rate of change are found to be the sum of the values determined for motion under an undisturbed free surface and a sinusoidal time-dependent component due to the sea waves. The phase angle and frequency relationships for the time-dependent components are found for both following-sea and head-sea conditions. (Author)

PB 157 077 $5.60

Gibbs and Cox, Inc., New York.
THE INFLUENCE OF END PLATES, STRUTS AND NACELLES UPON THE CHARACTERISTICS OF HYDROFOILS, by S. F. Hoerner. Technical rept. no. 14

on Hydrofoil Research Project, Subcontract to Contract Nonr-507(00). Aug 53, declassified 2 Feb 55. 56p. 20 refs. AD-20 089.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Hydrofoils, Hydrodynamics, Nacelles, Aspect ratio, Drag, Lift.

Experimental data correlated with theoretical results indicated that end plates attached to hydrofoils increase their effective aspect ratio. The lift induced drag of such foils approaching the water surface becomes that of a boxplane. Off-center struts have an effect similar to end plates. A pair of end struts at the foil tips may decrease the induced drag by 10 or 20%. Near zero foil lift, the interference induced drag at the foil and strut junction may be 0.2 without fairing. The corresponding interference drag of a complete conventional hydrofoil system is about 3% of the parasitic resistance. A strut which meets the wing in the vicinity of the center line disturbs the lift distribution and causes an additional induced drag. The increment resulting from a pair of unfaired struts is of the order of 10% of the basic foil-induced drag. The resistance of a plain, clean nacelle, including interference, corresponds to a drag coefficient of 0.047 in the vicinity of 0.1 lift coefficient and as much as 10% of the high-speed resistance of a typical hydrofoil boat. The interference drag of the nacelles is apparently increased by the thickness ratio of the foil section, by originally laminar boundary-layer foil flow, and by a high-wing arrangement. The results of a wind-tunnel investigation of strut and nacelle interference are appended.

PB 157 076 $6.60

Gibbs and Cox, Inc., New York.
SOME CHARACTERISTICS OF SPRAY AND VENTILATION, by S. F. Hoerner. Technical rept. no. 15 on Hydrofoil Research Project, Subcontract to Contract Nonr-507(00). Sep 53, declassified 2 Feb 55, 63p. 14 refs. AD-19 484.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Hydrofoils, Hydrodynamics.

The physical flow pattern of various surface-piercing struts and foils is analyzed on the basis of available experimental material. Statistical, but generalized functions are derived for height of and resistance due to spray. The mechanism of ventilation is described, critical Froude numbers with respect to ventilation are found, and a basic equation for the resistance due to ventilation is presented. The interaction between lift and ventilation is evaluated from the material on tested surface-piercing hydrofoils. (Author)

PB 157 078 $4.60

Hydrofoil Corp., Annapolis, Md.
THREE-DIMENSIONAL VORTEX-LINE THEORY OF A HYDROFOIL OPERATING IN WATER OF LARGE DEPTH. PART 1. THE WAVE DRAG OF A SINGLE HYDROFOIL WITH PRESCRIBED LIFT-DISTRIBUTION, by R. X. Meyer. Rept. on Contract Nonr-13600(1-4). 7 Feb 51, declassified 2 Feb 55. 44p. 10 refs. Technical rept. no. HR-5; AD-22 779.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Hydrofoils, Vortices, Drag, Theory, Lift, Mathematical analysis.

The bound-vortex drag was computed for different lift distributions of a single, straight bound-vortex line which, in conformance with Prandtl's airplane wing theory, replaced the hydrofoil. The bound-vortex line was parallel to the undisturbed interface and approximately at the centers of lift of the wing sections of the hydrofoil. The analysis neglected viscous forces and assumed irrotational fluid motion everywhere outside the bound vortex and trailing vortex sheet. Equations give the drag for cases of very short, very long, and arbitrary span. A curve shows the drag calculated for Froude number (N_{Fr}) of 10.85 and a rectangular lift distribution. The arbitrary span equations include the cases of very large and very small N_{Fr}'s. The problem of the optimum lift distribution of a hydrofoil is qualitatively discussed.

PB 150 948 $2.60

Iowa Inst. of Hydraulic Research, Iowa City.
STUDIES OF AXISYMMETRIC GRAVITY WAVES OF FINITE AMPLITUDE, by Lawrence R. Mack. Rept. on Contract Nonr-1509(03). Aug 60, 22p. 4 refs. AD-243 166.

DESCRIPTORS: Gravity, *Wave analysis, Liquids, Energy, Frequency, Density.

The results of two studies of finite-amplitude gravity waves are presented. Both studies are of periodic, axisymmetric, first-mode standing waves in liquids of general depth. The first discusses the division of the total energy into kinetic and potential portions for wave motion at the free surface of a single liquid. It is found that the ratio of the difference between the mean kinetic energy and the mean potential energy to the total energy of the wave has to the third approximation exactly the same variation with the depth of the liquid as does the finite-amplitude correction to the square of the frequency. The manner of the variation with depth of the deviation of the ratio of kinetic energy to total energy from its zero-amplitude value at any time is shown. The second study carries the solution for waves at the interface between two liquids of different densities through the second approximation when the upper and lower boundaries of the fluid region are rigid horizontal planes. The variation of the frequency of oscillation with the density ratio and with the depths of the fluids is shown, and general observations on the velocity and the configuration of the interface are made. (Author)

PB 152 038 $4.60

Wave Research Lab., U. of California, Berkeley.
VERIFICATION OF THE FROUDE MODELING LAW FOR HYDRAULIC BREAKWATER, by John A. Williams. Technical rept. on Contract Nonr-222(46). Aug 60, 46p. 8 refs. IER series no. 104; issue no. 11; AD-243 682.

DESCRIPTORS: *Breakwaters, Hydraulic systems, Hydraulic models, Water waves, Design.

Horsepower attenuation measurements for 3 model breakwaters were made and projected into the scale of

a larger fourth model by the Froude model law, with good agreement between the predicted values and the actual measured values of these quantities on the largest model. Surface current velocity measurements were made for each of the three smaller models, and current flow rate, kinetic energy and momentum calculated for various distances downstream from the breakwater. The measured velocity profiles proved to be similar for the three smaller models (facilities for such measurements were not available for the fourth and largest model) for a given wave at 100% attenuation, provided the distance downstream from the breakwater was modeled. Several velocity profiles at minimum current kinetic energy, for 100% attenuation of a given wave, were measured. A method for investigating the optimum size and spacing of the breakwater manifold orifices is suggested. Finally a comparison of the results with the G. I. Taylor (Proc. Roy. Soc., A, 231:466-478, 1955) theory for gravity wave destruction by opposing surface currents was given, and comments made on the validity of this theory for design purposes. (Author)

METALLURGY

IS-193 $2.25

Ames Lab., Iowa State U. of Science and Tech.
ANNUAL SUMMARY RESEARCH REPORT IN METALLURGY, JULY 59-JUNE 60. Rept. on Contract W-7405-eng-82. Dec 60, 119p.

ANL-6359 $2.00

Argonne National Lab., Ill.
PAPERS AND DISCUSSION FROM THE X-RAY PREFERRED ORIENTATION MEETING HELD AT ARGONNE NATIONAL LABORATORY DECEMBER 15 AND 16, 1960, ed. by M. H. Mueller. Rept. on Contract W-31-109-eng-38. May 61, 88p.

PB 156 893 $12.50

Armour Research Foundation, Chicago, Ill.
THE EFFECTS OF CARBON, PHOSPHORUS AND ALLOY CONTENTS ON THE NOTCHED BAR IMPACT PROPERTIES OF QUENCHED AND TEMPERED STEELS, by H. Schwartzbart and J. P. Sheehan. Rept. no. 39 (Technical) on Contract N6onr-274, T.O.1. 24 Feb 53, 174p, 3 refs. Proj. no. 90-466B; AD-8563.

This report released for sale to the public 18 July 61.

DESCRIPTORS: Carbon, Phosphorus, Physical properties, Temperature, Hardness, *Steel, Metallurgical analysis.

The V-notch Charpy impact properties of eight alloy grades of quenched and tempered steel have been investigated. In addition to presenting additional data on the effects of carbon, phosphorous, and alloy contents on the impact properties, the report includes data from past reports on these subjects. Three types of brittleness, manifested by high transition temperatures, are observed: 1. "A" brittleness, or 500°F embrittlement. This phenomenon is universally exhibited by practically all steels at all carbon levels and is greatest for the highest carbon level, 0.80% C. 2. "B" brittleness, or the 1200°F reversal. This is exhibited by the 2300 series and consists of an elevation in transition temperature for specimens tempered at 1200°F. 3. Temper brittleness. This is observed principally in the 0.80% C heat of each grade with the exception of the 2300 series. Steels containing molybdenum exhibit less temper brittleness than those containing no molybdenum. The transition temperature of a quenched and tempered steel is dependent, among other things, on carbon content, alloy content, and tempering temperature. Curves are presented relating these variables, which can be used to choose the optimum carbon level, alloy grade, and tempering temperature. Phosphorous raises the transition temperatures of 4100 and 5100 steels at practically all carbon levels and hardnesses. The deleterious effect of this element is greater in the 5100 grade, which contains no molybdenum, than in the 4100 grade, which contains molybdenum. (Author)

PB 171 908 $1.00

Battelle Memorial Inst., Columbus, Ohio.
FURTHER STUDIES ON RHENIUM ALLOYING EFFECTS IN MOLYBDENUM, TUNGSTEN AND CHROMIUM, by W. D. Klopp, F. C. Holden, and R. I. Jaffee. Technical rept. on Contract Nonr-1512(00). 12 July 60, 34p. 12 refs. AD-239 687.

DESCRIPTORS: *Rhenium alloys, *Molybdenum alloys, *Tungsten alloys, *Chromium alloys, Physical properties, Deformation, Mechanical properties, Impurities, Fractography, Tensile properties, Microstructure.

Further studies on molybdenum-rhenium alloys indicate that the improved fabricability is associated with redistribution of the grain-boundary oxide as a complex rhenium-molybdate. The tolerance for oxygen in Mo-35Re is several hundred ppm, but small increases in carbon or nitrogen render the alloy less fabricable. The contribution of valence electrons from rhenium to the molybdenum lattice is believed to be associated with the reduced interstitial solubility. The improved ductilities of Mo-35Re and W-30Re are associated with lower interstitial content, enhanced capacity for slip at low temperatures, and associated with low critical stresses for deformation by twinning, which appears to be a function of rhenium content alone. Rhenium also significantly lowers the ductile-to-brittle transition temperature of chromium to below - 196 C in bending. (Author)

PB 150 249 $3.60

Battelle Memorial Inst., Columbus, Ohio.
STUDIES OF MOLYBDENUM-, TUNGSTEN-, AND CHROMIUM-BASE ALLOYS WITH IMPROVED DUCTILITY, by W. D. Klopp, F. C. Holden, and R.I. Jaffee. Technical rept. on Contract Nonr-1512(00). 31 Aug 60, 34p. 21 refs. AD-241 980.

DESCRIPTORS: *Molybdenum alloys, *Tungsten alloys, *Chromium alloys, Physical properties, Mechanical properties, Tensil properties, Deformation, Additives, Impurities.

A study was conducted on rhenium-free alloys of molybdenum, tungsten, and chromium. The objective was to duplicate, if possible, the beneficial effect of rhenium. Twinning and reduction of interstitial solubilities are promoted by platinum-metal additions, while osmium, tantalum, and columbium changed the nature of the intergranular oxides. Improvements in the fabricability of cast molybdenum also were promoted by platinum-metal additions, particularly by osmium. These additions strengthened molybdenum but also increased the ductile-to-brittle bend transition temperature. (Author)

PB 156 898 $19.75

Boeing Airplane Co. [Seattle, Wash.]
DEVELOPMENT OF TITANIUM ALLOY CASTING METHOD, by R. V. Carter. Final technical engineering rept. Mar 58-May 60, on Contract AF 33(600)36450. Sep 60, 330p. 18 refs. D]-2786-8; AMC Technical rept. 60-7-656; AD-250 925.

This report released for sale to the public 18 July 61.

DESCRIPTORS: *Titanium castings, Casting, *Titanium alloys, Manufacturing methods, Specifications, Molding materials, Copper alloys, Heat treatment, Airframes, Production, Graphite.

A commercially feasible process was developed for production of titanium alloy castings for high performance aerospace vehicle applications. The recommended practice utilized a vacuum consumable-electrode arc furnace, a water cooled copper, tilt-pour crucible expendable rammed graphite molds, and centrifuge casting techniques. The Ti-6Al-4V alloy is the best casting alloy presently available, with as-cast tensile strength in excess of 150,000 psi and excellent surface finish. (Author)

PB 150 263 $1.60

Brown U. Div. of Engineering, Providence, R. I.
THE EFFECT OF INCREMENTAL LOADING ON CREEP BEHAVIOR OF METALS, by E. T. Onat and T. T. Wang. Technical rept. no. 20 on Contract Nonr-562(20). Aug 60, 19p. 13 refs. AD-242 225.

DESCRIPTORS: *Metals, *Creep, Stresses, Mechanical properties, Theory, Plastic flow, Elasticity, Loading.

In structural analysis it is of basic importance to know whether small deviations (in stress and strain) from a basic state obey a linear visco-elastic law for a given metallic material. The paper starts with a discussion of a proposed series of tests by which the existence and the form of such linear relations may be determined. In the following section preliminary results of the proposed type of tests with lead wires are discussed. Finally the importance of the rational determination of time operators in the visco-elastic law is illustrated in the case of creep buckling of initially straight columns. The buckling criteria of Rabotnov-Shesterikov [J. Mech. and Phys. Solids, 6:27, 1957] and Shanley [Weight-Strength Analysis of Aircraft Structures, chap. 19. N. Y., McGraw-Hill, 1952] are critically examined. The importance of the critical load based on the inelastic modulus is stressed. (Author)

PB 171 895 $2.50

Clevite Corp., Cleveland, Ohio.
PRODUCTION OF EXTRUSION BILLETS OF HIGH TEMPERATURE AIRCRAFT ALLOYS BY POWDER METALLURGY, by M. W. Toaz, G. F. Davies, and R. D. Johnson. Final technical engineering rept. for 1 June 59-15 Sep 60, on Contract AF 33(600)39327. [1960] 111p. 32 refs. AMC TR-60-7-764; AD-253 782.

DESCRIPTORS: *Heat resistant alloys, *Powder metallurgy, *Extrusion, *Hydrostatic pressure, *Powder alloys, Nickel alloys, Molybdenum alloys, Spaceships, Aircraft.

High temperature super alloys, Rene' 41 and PH 15-7 Mo for high performance aerospace vehicle structures can be economically extruded from powder metal billets. Hydrostatic compaction was determined as the available method best suited for large billet (1-1/2" diameter and larger) preparation and the density and mechanical properties of the powder metal extrusions were within 5 percent of wrought metal at room temperature. This investigation covered the selection of high temperature alloys in powder form; methods for processing including cold pressing, hydrostatic pressing, explosive or high energy pressing, slip casting; extrusion characteristics and technical and economical evaluation of powdered billet production. PH 15-7 Mo alloy showed a marginal cost advantage for the wrought alloy but there was an extremely favorable advantage for the powder metal Rene' 41 alloy in an evaluation and comparison of material and processing costs of powder metal and wrought billets.

PB 150 987 $1.10

Illinois Inst. of Tech., Chicago.
THE EFFECT OF REVERSED DEFORMATION ON THE STORED ENERGY RELEASED FROM COPPER DURING RECOVERY AND RECRYSTALLIZATION, by J. A. Wheeler, Jr. and Paul Gordon. Technical rept. no. 5 on Contract Nonr-1406(03). Aug 60, 10p. 1 ref. AD-243 575.

DESCRIPTORS: *Copper, *Deformation, Crystallization, Heat treatment, Energy, Metals, Lattices.

The release of stored energy during a one-step anneal at 237°C was 5.0 cal/mol for a high purity Cu sample which had been pulled to tension in 30% elongation. The total energy released from an identical sample in a two-step anneal was 6.2 cal/mole. It was concluded that the reversed deformation may produce new defects in the Cu lattice and rearrange those already present in such a way that many more of the defects are annealed out in recovery.

AD-255 531 repriced $0.50

National Aeronautics and Space Administration, Washington, D. C.
ELECTRICAL CHARACTERISTICS OF FOUR TERNARY PLATINUM-RHODIUM-BASE ALLOYS CONTAINING CHROMIUM, COBALT, OR RUTHENIUM, by Herman H. Lowell, Hubert W. Allen, and Joe E. Jenkins. May 61, 17p. Technical note D-867.

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-867.

DESCRIPTORS: Alloys, *Platinum alloys, Cobalt alloys, Chromium alloys, Ruthenium, *Rhodium alloys, Electrical properties, Resistance, Electrical conductance, Wire, Anemometers, Temperature.

Resistivities of small specimens of 5Co-15Rh-80Pt, 5Cr-15Rh-80Pt, 10Cr-15Rh-75Pt, and 5Ru-15Rh-80Pt were determined for temperatures up to 900 C. Resistance to progressive oxidation was observed in the Co- and Cr-containing alloys. The Co-containing alloy exhibited a shallow minimum of resistivity between about 200 and 400 C, but stability was not attained. The Cr-containing alloys exhibited very high and nearly constant rates of change of resistivity with temperature up to low-temperature reversible transformation points and were electrically stable at all temperatures. The Ru-containing alloy exhibited a linear and stable change of resistivity throughout its (lower) useful temperature range. (Author)

MITS-45 $1.75

Massachusetts Inst. of Tech., Cambridge.
THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Semi-annual progress rept. for the six-month period ending 31 Oct 60, on Contract AT(30-1)-956. 31 Oct 60, 72p.

OTS SB-465 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
NICKEL. May 61, 24p. 456 refs. OTS Selective Bibliography SB-465.

DESCRIPTORS: *Nickel, Bibliography, *Nickel alloys, Superalloys, Heat resistant alloys, Electrical properties, Magnetic properties, Electrodeposition, *Nickel compounds, Nickel catalysts, Scientific reports, Translations, Patents.

Lists PB reports, AEC reports, translations and Government-Owned patents on nickel metal, alloys, compounds, and catalysts added to the OTS collection during the period 1950 to May 1961. Includes reports on ultra pure nickel, superalloys, low and high temperature properties, electrical and magnetic properties, electrodeposition, and other research on nickel.

OTS SB-464 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
ZIRCONIUM (SUPPLEMENT TO CTR-344). May 61, 17p. 362 refs. OTS Selective Bibliography 464.

DESCRIPTORS: *Zirconium, Bibliography, Metals, Alloys, Zirconium compounds.

Lists PB reports, translations, and AEC reports added to the OTS collection during the period 1958 through May 1961. Includes information on zirconium metals, alloys, compounds, and government-owned patents. Research covers high temperature resistant materials, high purity metals, powder metallurgy, zirconium-hafnium separation, drip-casting, welding, cladding, and testing of zirconium. Also includes several reports on zirconium hazards and safety research.

PB 157 002 $15.50

Standard Pressed Steel Co., Jenkintown, Pa.
EVALUATION OF MECHANICAL PROPERTIES OF FIVE MATERIALS FOR FASTENER APPLICATIONS AT 900°F AND 1200°F, by Thomas C. Baumgartner, Edward F. Gowen, Jr. and Corey F. Crispell. Rept. for 28 Feb 57-30 Sep 59 on Contract AF 33(616)3646. Oct 59, 232p. WADC Technical rept. 59-631; AD-236 001.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Bolts, *Nuts (Mechanics), Materials, Mechanical properties, *Alloys, Tensile properties, Fatigue (Mechanics), Stresses, Rupture, Temperature, *Steel.

Determinations were made of the room and elevated temperature static and dynamic properties of bolts and nuts fabricated from high strength materials. Five alloys were selected to cover a temperature range from room to 1200°F and a strength range from 130,000 to 300,000 psi. Tensile, yield, and shear strengths were determined and tension-tension S-N fatigue curves were developed at room and elevated temperatures. The 100-hr stress rupture strength at maximum temperature was also found. For 900°F maximum service temperature a significant increase in fastener strength-to-weight realized by using bolts fabricated from VascoJet 100 heat-treated to 220,000 psi minimum, at no sacrifice in dynamic properties. The fatigue strength increased proportionally with the tensile strength when compared to AMS 6304 heat-treated to 160,000 psi minimum. Bolts fabricated from AMS 5732 to 7478 with high radius threads exceed the requirements of AMS 7478 by a significant amount. The tensile strengths of bolts of Incoloy 901 and AMS 5735 was comparable. The yield and fatigue endurance limits of the Incoloy 901 are more than those of the AMS 5735 at room and elevated temperatures.

Light Metals

PB 171 882 $0.75

Metals and Ceramics [Lab.] Wright Air Development Div., Wright-Patterson AFB, Ohio.
TENSION, TORSION AND COLUMN PROPERTIES OF COMMERCIALLY PURE TITANIUM TUBING AT ROOM TEMPERATURE, by Robert G. Henning. Rept. for Sep 58-Mar 60 on Metallic Materials. Dec 60, 30p. WADD Technical note 60-201.

DESCRIPTORS: *Titanium tubing, Tensile properties, Stresses, Deformation, Tests, Metals.

Tensile, torsion and column properties were determined at room temperature on one heat of commercially pure titanium A 55 tubing in 1-inch and 3/8-inch outside diameters and varying wall thicknesses. Typical stress-strain diagrams are presented for torsion and tension. Torsion/tension and column/tension ratios vs diameter/wall thickness graphs are presented. (Author)

PB 153 787 $2.60

Sciaky Bros., Inc., Los Angeles, Calif.
IMPROVED METHOD OF EVALUATING SPOTWELD QUALITY IN TITANIUM ALLOYS. Final rept. for 20 Oct 56-20 Apr 57 on Contract NOa(s) 55-954-c. 1 June 57, 30p. AD-143 419.

DESCRIPTORS: *Titanium alloys, *Spot welds, Test methods, Titanium, Alloys, Welds.

A Sciaky Torsional Strength Machine was used to derive torsional shear data of sufficient magnitude to permit quality evaluation of resistance spotwelds in Ti alloys. By comparison of graphic records of the torsion-shear values, the various spotweld quality factors observed were correlated with standard test data in the areas of hardness, ductility and resilience, fatigue life, and tension-strength (tension-shear and cross tension). A practical testing procedure was developed for the use of the Sciaky machine operating under production conditions. The torsion shear test may be developed for determining single spotweld joint strength in various materials. A good correlation, independent of mode of fracture, exists between ultimate tensile shear load and maximum torque for various strength spotwelds in Ti AllOAT. Spotweld metal ductility in heat treatable metals can be determined by the torsion shear test. The angle twist value of the torsion shear test is a direct function of the spotweld ductility, while the ductility criteria from tests based on tension/tensile shear ratios is arbitrary.

Structural Metallurgy and Corrosion

NAA-SR-5927 $0.75

Atomics International, Canoga Park, Calif.
MOLTEN PHOSPHATE REACTOR FUELS III. MASS SPECTROMETRIC IDENTIFICATION OF GASEOUS CORROSION PRODUCTS OF METALS IN MOLTEN SODIUM POLYPHOSPHATE, by L. F. Grantham, M. A. Hiller, and others. Rept. on Contract AT(11-1)-GEN-8. 15 June 61, 34p.

PB 153 585 $1.60

Illinois U., Urbana.
INFLUENCE OF PLASTIC DEFORMATION ON THE ANNEALING OF QUENCHED GOLD, by S. Yoshida and J. S. Koehler. Technical rept. no. 1 on Contract DA 11-022-ORD-2691. Sep 59, 17p. 2 refs. OOR rept. 2079:1-Met; AD-231 420.

DESCRIPTORS: *Gold, Plastic flow, Heat treatment, Microstructure, Lattices, Molecular structure, Deformation.

Experiments designed to study the influence of plastic deformation on the annealing behavior of lattice vacancies were carried out. The 99.999% pure polycrystalline gold specimens were quenched from 700°C. All resistance measurements were made at liquid nitrogen temperature. The observed activation energy was found to be less than that observed before deformation, suggesting that more divacancies and perhaps higher vacancy clusters exist in deformed specimens than in annealed specimens. Explanations of this finding are discussed. (Author)

PB 156 886 $4.60

Massachusetts Inst. of Tech. [Cambridge].
DEFORMATION OF MATERIALS AT ELEVATED TEMPERATURES, by Arup Chaudhuri, Gordon Gemmell and others. Final rept. Apr 51-31 Jan 55, on Contract AF 33(616)23281. Jan 55, 44p. 24 refs. AD-56 362.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Aluminum, *Aluminum alloys, *Creep, Deformation, Rupture, Magnesium, Copper, Zinc, High temperature research.

Research was conducted on the deformation mechanisms prevailing in high-purity Al and its alloys during creep in the range of 200 to 1100°F. Current research is reported on the following: (1) role of solid solution hardening in Al on the creep behavior at elevated temperatures; (2) creep deformation of Mg at elevated temperatures; (3) strain mapping in polycrystalline high-purity Al during creep at elevated temperatures; (4) oxide cracking during creep of pure Al as a measure of strain; and (5) effect of prior substructure on the creep strength of high-purity Al.

PB 154 493 $7.60

Massachusetts Inst. of Tech., Cambridge.
RESEARCH ON PARAMETERS INFLUENCING FLUIDITY IN ALUMINUM BASE ALLOYS. Final rept. on Contract DA 19-020-507-ORD-4503. 1 July 59, 79p. 16 refs; AD-232 914.

DESCRIPTORS: *Aluminum alloys, Molding, Castings, *Aluminum castings, *Mold washes, Test methods.

Two separate studies were pursued; (1) in a specially designed green sand mold fluidity spiral and (2) in a "vacuum fluidity test". A double spiral sand mold fluidity test was developed so that effects of various mold treatments might be studied in one spiral, using the other spiral as a "control". Reproducibility of this test is within ±1 inch of flow. Hexachloroethane mold coating was found to improve fluidity of 195 alloy (Al-4.5% Cu) by as much as factor of three (.006" coating thickness); other effective coatings were carbon black, $CaSO_4$, $ZnCO_3$, $CaCO_3$. A plate casting was employed to show that results obtained in the fluidity spiral apply to platelike castings. Fluidities of five aluminum alloys were compared, and hexachloroethane was shown to improve fluidity of each of these alloys. The vacuum fluidity test was used to study effect of a number of variables on fluidity of 195 alloy; variables studied included temperature, pressure, mold atmosphere, and mold coatings. Theoretical considerations of the mechanisms whereby mold treatments improved fluidity in the vacuum fluidity test led to the tentative conclusions that (1) the major factor leading to improved fluidity was the insulating effect of the various coatings, and (2) a second factor was reduction in metal-mold friction ("lubricating" effect of the coatings). (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

IS-275 $2.25

Ames Lab., Iowa State U.
STEADY-STATE NUCLEAR INDUCTION SIGNAL SHAPES IN LITHIUM METAL, by D. R. Torgeson, W. H. Jones, Jr. and R. G. Barnes. Nov 60, 101p.

ANL-6361 $1.75

Argonne National Lab., Ill.
COUNTING METHODS FOR THE ASSAY OF RADIOACTIVE SAMPLES, by E. P. Steinberg. Rept. on Contract W-31-109-eng-38. May 61, 72p.

BMI-1521 $0.50

Battelle Memorial Inst., Columbus, Ohio.
EFFECTS OF RADIATION UPON HAFNIUM DIBORIDE, by R. A. Ewing and D. N. Sunderman. Rept. on Contract W-7405-eng-92. 14 June 61, 10p.

BNL-655 $0.50

Brookhaven National Lab., Upton, N. Y.
GAMMA IRRADIATION OF GASEOUS CO_2, by M. Steinberg. Radiation processing rept. no. 3. Mar 61, 14p.

PB 156 747 $1.60

Convair, Fort Worth, Tex.
PERIOD CALIBRATOR, by Bruce Richerson. Rept. on Contract AF 33(600)38946. 15 Aug 60, 20p. 2 refs. NARF-60-18T; MR-N-246; AD-242 798.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Neutron flux density, Monitors, Calibration, Instrumentation, Neutron detectors, Ionization chambers, *Amplifiers.

An improved electromechanical instrument was built for the purpose of testing and calibrating log-N amplifiers and period meters. The period calibrator can generate currents in the range of 10^{-10} to 10^{-4} amperes; from these, it can supply the following signals: (1) a current that increases or decreases exponentially with time over a range of two decades. The period of change may be chosen from between 3 and 100 seconds; (2) two ranges of linear voltage from 0 to 24 VDC and from 50 to 150 VDC; and (3) an adjustable step increase in current. The generation of an exponential varying signal is achieved by rotating at constant speed three ganged Helipots that are connected in a network with fixed resistances. The circuit is so designed that the output current from the attenuator approximates an exponential function of the angle of rotation of the motor. A counting-rate circuit is used to measure the angular velocity of the motor. (Author)

PB 150 132 $12.00

Haverford Coll., Pa.
ENERGY LEVELS OF LIGHT NUCLEI (A = 5 to 20) by F. Ajzenberg-Selove and T. Lauritsen (Kellogg Radiation Lab.) Rept. on [Contract Nonr-220(18)]. Aug 60, 167p. 435 refs. AD-243 631.

DESCRIPTORS: *Atomic energy levels, Bibliography, *Nuclei.

PB 149 808 $3.60

High Energy Physics Lab., Stanford U., Calif.
NUCLEAR EXCITATION BY SCATTERING OF 40-MEV ELECTRONS, by W. C. Barber, F. Berthold and others. Rept. on Contract [N6onr-251(16)] 1 Aug 60, 37p. 42 refs. HEPL-205.

DESCRIPTORS: *Electrons, Scattering, Neutron cross sections, Excitation, Nuclear energy, Nuclear resonance, Photons, Linear accelerators, *Electromagnetic fields.

The electron energy spectra resulting from the scattering of 40-Mev primary electrons were measured for the purpose of studying nuclear excitations. Targets of Li^6, Be, C, and Si were employed at scattering angles of 132° and 160°; Pb was studied at a single angle of 160°. In addition to the elastic peaks, all spectra show peaks corresponding to excitation of the target nucleus into well-defined energy states.

PB 156 863 $1.10

Illinois U., Urbana.
NUCLEAR MAGNETIC RESONANCE SPECTRUM OF N-BENZYLTHIENO [3, 2-b] PYRROLE, by R. J. Tuite, H. R. Snyder and others. Technical rept. no. 33 on Contract Nonr-1834(13). 4 Aug 60, 8p. 13 refs. AD-248 961.

DESCRIPTORS: Benzyl radicals, *Thiophenes, Spectrographic analysis, Spin, *Pyrroles, *Nuclear magnetic resonance, Protons, Nuclear spins

PB 156 087 $8.10

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT. Rept. no. 53, 1 June-31 Oct 58 on Contract [Nonr-1841(16)] and National Science Foundation Grant G4532. 31 Oct 58, 88p. 100 refs.

DESCRIPTORS: *Nuclear physics, *Radiochemistry, Fission, Cosmic rays, Accelerators, Linear accelerators, Generators, Radioactivity, Cyclotrons.

Contents:
Chemistry of the fission elements group
Nuclear chemistry (inorganic) group
Nuclear chemistry (organic) group
Cosmic ray group
High energy accelerator physics group
Bubble chamber group
Linear accelerator group
Rockefeller generator group
ONR generator group

Radioactivity group
Cyclotron group
Theoretical group
(See also PB 144 101)

PB 150 228 $1.60

Michigan U., Ann Arbor.
DIRECT PAIR PRODUCTION BY HIGH ENERGY MUONS, by John F. Gaebler, Wayne E. Hazen, and Alfred Z. Hendel. Rept. on Cosmic Ray Investigations, Contract Nonr-1224(07). 23 Aug 60, 20p. 13 refs. AD-242 608

DESCRIPTORS: *Cosmic rays, *Mesons, *Cloud chambers, Electron, Cosmic ray bursts, *Electromagnetic effects, *Pair production.

A multiplate cloud chamber was operated 1032 ft underground to study electromagnetic interactions of fast cosmic ray muons. 222 electron showers were observed. A histogram was obtained for transferred energies from 30 to 3000 Mev. The showers are primarily due to direct pair production and knock-on processes. The results indicate that there is agreement with knock-on theory but that the direct pair production cross section is about 1/2 that predicted by the Murota-Ueda-Tanaka theory (Progr. Theor. Phys. 16:482, 1956). (Author)

PB 156 885 $3.60

Polytechnic Inst. of Brooklyn, N. Y.
INSULATION: A STUDY OF PHYSICAL AND CHEMICAL PROPERTIES OF ORGANIC COMPOUNDS INCLUDING HIGH VALUE INSULATORS AND THEIR BEHAVIOR DURING AND AFTER EXPOSURE TO X- AND GAMMA RADIATION, by J. Steigman, A. Copperman and others. Interim rept. no. 1, 1 July-30 Sep 51, on Contract DA 36-039-sc-15327. 15 Oct 51, 34p. 42 refs. NP-4434, ATI-123 875.

This report released for sale to the public 19 July 61.

DESCRIPTORS: Gamma rays, X-rays, *Insulating materials, Organic compounds, Physical properties, Chemical properties, Polymers, Styrenes, Halides, Radiochemistry.

The Wheatstone Bridge method for measuring high resistances employed by the Federal Telecommunications Laboratory, Inc., has been subjected to analysis and a number of questions were raised concerning its use. The circuit will be reproduced and tested critically. A design for a string electrometer for application in the measurement of high resistances is presented, and when constructed may serve as the basic apparatus for the measurement of high resistances. The literature on the effect of ionizing radiation on polystyrene, the degradation of polystyrene, and styrene monomer-polymer exchange phenomena has been reviewed. A brief review of the literature of the irradiation of organic materials pertinent to the problem of the effect of ionizing radiation on alkyl halides is presented in addition to a brief survey of the general aspects of radiation chemistry.

MATT-57 $0.50

Princeton U., N. J.
ON THE CORRESPONDENCE BETWEEN THE SOLUTIONS OF THE COLLISIONLESS EQUATION AND THE DERIVED MOMENT EQUATIONS, by C. Oberman Project Matterhorn. Rept. on Contract AT(30-1)-1238. Dec 60, 10p.

DP-587 $0.50

Savannah River Lab., Aiken, S. C.
COMPOSITION AND STABILITY OF "ULTRASENE", by D. L. West. Rept. on Contract AT(07-2)-1. June 61, 14p.

DP-558 $0.50

Savannah River Lab., Aiken, S. C.
ELECTROLYTIC SEPARATION FACTORS FOR HYDROGEN ISOTOPES, by R. R. Foster, D. H. Purcell, and J. A. Wheat. Rept. on Contract AT(07-2)-1. Apr 61, 16p.

NYO-2764 $3.00

Tracerlab, Inc., Waltham, Mass.
THE STUDY OF INVERSE RADIOACTIVE TRACER TECHNIQUES AND APPLICATIONS OF RADIOACTIVE QUINOL CLATHRATES. Annual rept. no. 2 on Contract AT(30-1)-2204. 1 July 60, 107p.

Elementary Particles

ANL-6373 $0.75

Argonne National Lab., Ill.
THEORETICAL REACTION CROSS SECTIONS FOR ALPHA PARTICLES WITH AN OPTICAL MODEL, by J. R. Huizenga and G. J. Igo. Rept. on Contract W-31-109-eng-38. May 61, 28p.

PB 150 756 $1.60

High Energy Physics Lab., Stanford U., Calif.
A MICROWAVE SEPARATOR FOR HIGH-ENERGY PARTICLE BEAMS, by P. R. Phillips. Rept. on Contract N6onr-251(16). 18 Aug 60, 14p. HEPL-213.

DESCRIPTORS: *Linear accelerators, Microwave equipment, Design, Construction, *Particle beams, Particles, Deflection, Electrons, Separation.

This paper describes the design and construction of a microwave separator for high-energy particle beams, following the original ideas of Panofsky and Wenzel. A TM_{012} rectangular cavity was used with a Q of 15 000 and a maximum power dissipation of 1.3 Mw. With this, electrons of 150 Mev/c momentum were deflected through 3/4 in. at the final focus of the analyzing magnet. The available aperture is so small that the technique is not immediately useful, but it is anticipated that it may become so at higher energies, when other methods of beam separation become unfeasible. (Author)

PB 149 563 $1.60

Northwestern U., Evanston, Ill.
PARTITION FUNCTIONS AS AVERAGES OF FUNCTIONALS OF GAUSSIAN RANDOM FUNCTIONS, by A. J. F. Siegert. Technical rept. no. 4 on Contract Nonr-1228(13). [1960] 11p. 7 refs. AD-240 857.

DESCRIPTORS: *Particles, Energy, Density, Functions, Mathematical analysis.

Expressions for the partition functions can be obtained by a method which entirely bypasses the second quantization formalism. Expressions for the density matrix and the partition functions are given. A slightly simplified form for the iterated Green's functions used is also given.

Instruments and Installations

PB 156 748 $5.60

Convair, Fort Worth, Tex.
NITROUS-OXIDE DOSIMETRY SYSTEM, by D. A. Flory and W. R. McIntosh. Rept. on Contract AF 33(600)38946. 23 Jan 61, 56p. 9 refs. NARF-60-34T; FZK-9-152; AD-251 118.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Dosimeters, Design, Oxides, *Radiation counters, Gamma rays, Neutrons, *Nitrogen compounds, Vacuum systems, Sensitivity, Containers, Radiation effects.

Convair has developed a nitrous-oxide dosimetry system based on the reactions reported by Harteck and Dondes. The dosimeters, which are capable of measuring integrated gamma doses over a range of from 10 to the 8th power to 10 to the 12th power ergs/gm(C), are of simple construction and relatively inexpensive. With the complementary vacuum system, eight of the simplified dosimeters can be filled and read out per hour. Experimental results on temperature dependence, dose-rate dependence, postirradiation stability, and the effect of varying the amount and pressure of the nitrous-oxide gas are reported. Calculations on the neutron sensitivity, G-value, W-value, and air-equivalence of the dosimeter are also included. The results of this study show that this dosimetry system is a valuable tool in radiation effects testing. (Author)

UCRL-9504 $1.75

Lawrence Radiation Lab., U. of California, Berkeley.
A THEORETICAL COMPARISON OF 47 FAST-NEUTRON SPECTROMETERS, by C. M. Kim. Rept. on Contract W-7405-eng-48. Nov 60, 69p.

TID-3550(Rev. 1) $2.75

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
NUCLEAR INSTRUMENTATION. A literature search comp. by H. D. Raleigh and R. L. Scott. June 61, 152p.

DP-544 $0.50

Savannah River Lab., Aiken, S. C.
A WALK-THROUGH MONITOR FOR BETA-GAMMA SHOE CONTAMINATION, by H. V. Hardison. Rept. on Contract AT(07-2)-1. Jan 61, 8p.

Nuclear Engineering and Power

ANL-6350 $0.75

Argonne National Lab., Ill.
DESIGN AND DEVELOPMENT REPORT ON TREAT CONTROL ROD DRIVE II, by R. V. Batch. Rept. on Contract W-31-109-eng-38. May 61, 35p.

NAA-SR-4488(Suppl.) $1.50

Atomics International, Canoga Park, Calif.
SRE FUEL ELEMENT DAMAGE. Final rept. on Contract AT(11-1)-GEN-8. 30 June 61, 62p.

BMI-1517 $1.00

Battelle Memorial Inst., Columbus, Ohio.
BOILING-WATER VOID DISTRIBUTION AND SLIP RATIO IN HEATED CHANNELS, by J. J. Foglia, F. G. Peter, and others. Rept. on Contract W-7405-eng-92. 31 May 61, 33p.

FZK-122 $3.00

Convair, Fort Worth, Tex.
MILITARY FIELD EXPEDIENT SHIELDING EXPERIMENT, by D. M. Wheeler and L. H. Bostick. Rept. on Contract DA-44-192-eng-13. 18 Oct 60, 233p.

DP-615 $0.75

du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS, comp. by R. R. Hood and L. Isakoff. Progress rept. for Apr 61 on Contract AT(07-2)-1. June 61, 28p.

MIT-OR-6 $1.50

Engineering Practice School, Mass. Inst. of Tech., Oak Ridge, Tenn.
METHODS FOR DETERMINING FUEL BURNUP, by R. L. Stover and G. K. Moeller. Rept. on Contract W-7405-eng-26. 5 July 61, 59p.

GA-1721 $0.50

General Atomic Div., General Dynamics Corp., San Deigo, Calif.
MARITIME GAS-COOLED REACTOR PROGRAM. THE SLOWING-DOWN OF FISSION NEUTRONS IN BERYLLIUM OXIDE, by A. J. Goodjohn and J. C. Young. Rept. on Contract AT(04-3)-187. 6 June 61, 24p.

UCRL-9546 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
BEVATRON OPERATION AND DEVELOPMENT XXVII, AUGUST, SEPTEMBER, OCTOBER 1960, by W. D. Hartsough and G. R. Lambertson. Rept. on Contract W-7405-eng-48. 2 Mar 61, 25p.

UCRL-9416 $1.00

Lawrence Radiation Lab., U. of California, Berkeley.
PRELIMINARY STUDIES ON BEAM PROGRAMMING IN A CYCLOTRON, by H. A. Willax. Rept. on Contract W-7405-eng-48. 30 Sep 60, 41p.

LAMS-2564 $0.50

Los Alamos Scientific Lab., N. Mex.
LAMPRE PROGRAM. Quarterly status rept. for period ending 20 May 61 on Contract W-7405-eng-36. June 61, 23p.

MND-P-2483-1 $2.00

Martin Co., Baltimore, Md.
SNAP PROGRAMS. Quarterly progress rept. no. 1 on Contract AT(30-3)-217, Task 8, Strontium-90 fueled thermoelectric generator development, 1 Nov 60-31 Jan 61. June 61, 82p.

GEAP-3680 $0.50

Vallecitos Atomic Lab., Pleasanton, Calif.
INFORMATION ON THE USE OF BORON CARBIDE AS A NUCLEAR CONTROL AND POISON MATERIAL, by E. W. Hoyt. Technical rept. on Contract AT(04-3)-189. 15 Mar 61, 20p.

GEAP-3639 $0.50

Vallecitos Atomic Lab., Pleasanton, Calif.
INTERCOMPARISON MEASUREMENTS, by W. C. Ballowe, W. R. Morgan, and J. L. Russell, Jr. Technical rept. on Contract AT(04-3)-189. 18 Jan 61, 20p.

Nuclear Reactions

PB 155 820 $3.60

Institute of Mathematical Sciences, New York U., N. Y.
MODIFICATION OF EFFECTIVE RANGE THEORY IN THE PRESENCE OF A LONG-RANGE (1/r4) POTENTIAL, by Thomas F. O'Malley, Larry Spruch, and Leonard Rosenberg. Rept. on Contracts AF 19(604)4555, DA 30-069-ORD-2581 and Nonr-285(49). Feb 61, 32p. 19 refs. Research rept. no. CX-54; AFCRL-245; AD-254 855.

DESCRIPTORS: *Nuclear reactions, Series, *Scattering, *Taylor series, Nucleons, Proton scattering, *Quantum mechanics, Nuclear physics, Mathematical analysis, Nuclear energy, *Potential scattering.

UCRL-9619 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
ANGULAR DISTRIBUTIONS FROM HEAVY-ION-INDUCED FISSION, by V. E. Viola, Jr. Rept. on Contract W-7405-eng-48. 24 Mar 61, 91p.

UCRL-9656 $1.50

Lawrence Radiation Lab., U. of California, Berkeley.
LOW-ENERGY PION-PHOTON INTERACTION. THE (2π, 2γ) VERTEX, by B. R. Desai. Rept. on Contract W-7405-eng-48. 20 Apr 61, 57p.

UCRL-9322 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
MOMENTUM DEPENDENCE OF THE ASYMMETRY IN MUON DECAY, by H. Kruger. Rept. on Contract W-7405-eng-48. 2 Feb 61, 81p.

UCRL-5573 $5.00

Lawrence Radiation Lab., U. of California, Livermore.
TABULATED DIFFERENTIAL NEUTRON CROSS SECTIONS. Part III, Volume I, $_1H$-$_{94}Pu$, 0-15 Mev, by R. J. Howerton. Rept on Contract W-7405-eng-48. Jan 61, 438p.

LAMS-2570 $0.75

Los Alamos Scientific Lab., N. Mex.
LASL CONTROLLED THERMONUCLEAR RESEARCH PROGRAM. Quarterly status rept. for period ending 20 May 61 on Contract W-7405-eng-36. June 61, 42p.

Radioactivity

TEI-777 $2.00

Geological Survey, Washington, D. C.
GEOLOGIC INVESTIGATIONS OF RADIOACTIVE DEPOSITS, 1942-1960. A Bibliography of U. S. Geological Survey Publications on the Geology of Radioactive Deposits, by A. Brown. Jan 61, 86p.

HASL-113 $2.50

Health and Safety Lab., Atomic Energy Commission, N. Y.
FALLOUT PROGRAM, by E. P. Hardy, Jr., J. Rivera, and R. Frankel. Quarterly summary rept. 1 Mar 61-1 June 61. 1 July 61, 122p.

PB 155 511 $5.60

North Carolina State Coll., Raleigh.
THEORETICAL EVALUATION OF THE VARIANCE OF THE CORRELATION METHOD FOR THE TWO-FOLD PROMPT RADIOACTIVE DECAY CHAIN WITH NONCONSTANT SOURCE, by Wesley O. Doggett and Gary T. Smith. Technical rept. no. 3 on Contract DA 01-009-ORD-820. Dec 60, 55p. 8 refs. OOR rept. no. 2543:3.

DESCRIPTORS: Nuclear reactions, Half life, Measurement, Statistical analysis, Correlation techniques, *Radioactive decay, Radioactive equilibrium.

A time correlation method proposed by Gold'anski and Po[illegible]goretski (Soviet Physics JETP 2: 441-450, 1956) for investigating two connected nuclear disintegrations is studied. The method permits the investigation of daughter activities in equilibrium with long lived parents without the count rate restrictions imposed on the usual coincidence method by the occurrence of accidental coincidences. The average value and variance of the correlation measurement are theoretically evaluated for the case of a prompt parent-daughter cascade with negligible background in which the parent decay during the experiment is not negligible. (Author)

PHYSICS

LA-2507 $1.25

Los Alamos Scientific Lab., N. Mex.
GAMMA-RAY MEASUREMENTS IN AND ABOVE THE ATMOSPHERE, by J. A. Northrop. Rept. on Contract W-7405-eng-36. Dec 60, 48p.

PB 151 390 $2.25

National Bureau of Standards, Boulder, Colo.
AN ATLAS OF OBLIQUE-INCIDENCE IONOGRAMS, by Vaughn Agy, Kenneth Davies and Roger Salaman. Nov 59, 141p. 5 refs. Technical note no. 31.

DESCRIPTORS: *Ionospheric propagation, *Radio charts.

This atlas is intended to serve a twofold purpose: first, to provide a compilation of records, of a type becoming standard in the field of ionospheric research, for those workers who are not now familiar with them, and second, to present records which are characteristic of the specific paths used by the National Bureau of Standards for consideration by those using other paths.

SCDR-78-61 $0.50

Sandia Corp., Albuquerque, N. Mex.
MEASUREMENT OF FREE SURFACE MOTION BY THE SLANTED RESISTOR TECHNIQUE, by L. M. Barker. May 61, 19p.

Electricity and Magnetism

PB 150 136 $2.60

Dartmouth Coll., Hanover, N. H.
THERMOELECTRIC POWER OF SILVER HALIDES, by Robert W. Christy. Technical rept. no. 1 on Thermoelectric Behavior of Ionic Crystals, Contract Nonr-2799(00). Aug 60, 29p. 23 refs. AD-242 167.

DESCRIPTORS: *Thermoelectricity, *Silver compounds, Halides, *Entropy, Crystals, Impurities.

Thermoelectric power measurements have been made on the systems silver chloride + cadmium chloride, silver bromide + silver sulfide and silver bromide + cadmium sulfide, as well as the pure silver halides, in the temperature range from 100° to 400°C. Silver metal electrodes were used.

PB 150 643 $2.60

Honeywell Research Center, Hopkins, Minn.
AN APPARATUS FOR THE MEASUREMENT OF MAGNETIZATION IN DILUTE ALLOYS AT LOW TEMPERATURES, by O. S. Lutes and J. L. Schmit. Rept. on Contract Nonr-2732(00). Aug 60, 21p. 7 refs. HR-60-515; AD-243 105.

DESCRIPTORS: *Magnetic materials, *Alloys, *Magnetic moments, Measurement, Low temperature research, Refrigeration systems, *Instrumentation, Resistance thermometers, Calibration, Thermometers, Helium.

A description is given of an apparatus for the measurement of magnetic moment of metallic samples under isothermal conditions at temperatures extending below 1°K. The report covers He^3 refrigeration, the magnetic measurement, and thermometry.

Electronics

PB 150 111 $9.10

Eaton Electronics Research Lab., McGill U. (Canada).
FINAL REPORT, by Richard Stevenson and C. H. Champness. Rept. for 1 Sep 59-30 Aug 60 on Contract Nonr-3013(00). Aug 60, 110p. 37 refs. AD-241 759.

DESCRIPTORS: Magnetic susceptibility, Measurement, *Magnetic fields, *Magnet coils, Failure (Mechanics), *Resistance, Indium alloys, Antimony alloys, Intermetallic compounds, Single crystals, Phase studies, Ammonium radicals, Halides, *Phase transitions, Fluorides.

Measurement of Magnetic Susceptibility in Very High Pulsed Field: A technique was developed for making Gouy-type measurements where the magnetic force on the sample travels as a stress wave through the apparatus and excites a voltage on 2 piezoelectric crystals which are the active elements of the transducer. High Field Susceptibility Measurements on 9 Substances:

Measurements were made on (1) $MnSO_4$, (2) $MnSO_4 \cdot H_2O$, (3) $MnCO_3$, (4) $MnBr_2$, (5) MnO_2, (6) $CoSO_4$, (7) $CoSO_4 \cdot 7H_2O$, (8) $NiCl_2$, and (9) Cr. Typical Failures in Pulsed Magnet Coils: Failures discussed include those which occur in a 700,000- to 800,000-oer magnetic field, those characteristic of lower field operation, and flaws in the coil. Magnetoresistance and Hall Effect in Oriented Single Crystal Samples of n-Type InSb: Besides evidence of inhomogeneity, the results indicated directional dependence of the longitudinal magnetoresistance. Some Preliminary High Magnetic Field Transverse Magnetoresistance on p-Type InSb: At a field of 150 kilogauss, a 150-fold increase in resistance occurred at room temperature. Phase Transitions in the Ammonium Halides: High-pressure experiments indicated 2 new phase transitions for NH_4I and a new triple point, and new transitions and triple points in NH_4Br and ND_4Br. Phase Transitions in NH_4F: High-pressure experiments revealed a phase transition at 3800 atm with a volume change of about 28%.

PB 154 801 $1.10

Michigan State U. [East Lansing].
MATHEMATICAL THEORY OF ANTENNA RADIATION, by Charles P. Wells and A. Leitner. Final rept. for 15 Oct 58-15 Oct 60 on Contract DA 20-018-ORD-18456. [1960] 8p. 5 refs. OOR rept. 2116:2-M; AD-248 739.

DESCRIPTORS: *Antennas, Impedance, Mathematical analysis, Admittance, Theory, Antenna radiation patterns, Spheres.

Assume the problem source to be a conducting sphere of radius (a) with a field E_t applied at the surface. This report discusses some aspects of the problem of natural oscillation of the sphere or, what amounts to the same thing, the general impedance function problem for spherical antennas. (Author)

Molecular Physics and Spectroscopy

PB 155 510 $1.10

Emory U., Ga.
MICROWAVE INVESTIGATION OF MOLECULAR STRUCTURE AND PROPERTIES, by James W. Simmons and J. H. Goldstein. Final rept. 1 Sep 59-31 Aug 60 on Contract DA 01-009-ORD-790. [1960] 10p. OOR rept. 2482:1-P; AD-247 196.

DESCRIPTORS: *Molecular spectroscopy, *Molecular structure, *Microwave spectroscopy, Molecules, Organic compounds.

Extensive studie of several organic molecules were continued. The recording system was improved to obtain more sensitivity and better resolution in determinations of molecular structure and quadrupole coupling constants, and the K-band Stark-effect spectroscope was reconstructed. In particular the following molecules were studied: chloroallene, bromoallene, acrolein, and propargyl chloride.

PB 155 362 $4.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
VIBRATIONAL RELAXATION IN CARBON DIOXIDE, by W. J. Witteman. Rept. on Contract AF 49(638)401. Jan 61, 41p. 6 refs. Technical note BN-226; AFOSR-410; AD-253 294.

DESCRIPTORS: *Carbon dioxide, Vibration, Excitation, *Relaxation time, Molecules, Mathematical analysis, Bessel functions, Energy.

The vibrational excitation of a CO_2 molecule in collision with another CO_2 molecule is investigated. A derivation of the cross section by means of the method of the distorted waves and the rate of total energy transfer are presented. There are two relaxation processes with different relaxation times related to direct excitation of the bending mode and excitation in series of the valence mode. Experimental results confirm this conclusion. The experimental relaxation time for the bending vibration was one-half of the calculated value, which may be considered a fair agreement in view of the uncertainty involved in the interaction potential and of other approximations which had to be introduced into the calculations. (Author)

Optics

PB 150 661 $1.60

Massachusetts U., Amherst.
A PROCEDURE FOR THE ACCURATE MEASUREMENT OF INFRARED DICHROISM OF ORIENTED FILMS, by Richard S. Stein. ONR Technical rept. no. 23 on Contract Nonr-2151(00). 22 Aug 60, 11p. 5 refs. AD-244 448

DESCRIPTORS: *Infrared radiation, *Refraction, *Films, Absorption, Spectrographic analysis, Polarization, *Polymers, Mathematical analysis, *Dichroism

A method is described for measuring directly the infrared dichroism spectrum of a film using a single beam spectrometer. The method involves modulating the beam passing through the sample with a rotating polarizer rather than with a chopper. The AC response of a detector is then proportional to the difference between the principal absorbencies of the sample. (Author)

PB 150 662 $1.10

Massachusetts U., Amherst.
THE USE OF AN INSTRON TESTING MACHINE FOR THE DETERMINATION OF STRESS AND STRAIN-OPTICAL COEFFICIENTS, by Daniel A. Keedy, Richard J. Volungis, and Hiromichi Kawai. ONR Technical rept. no. 24 on Contract Nonr-2151(00). 22 Aug 60, 7p. 5 refs. AD-244 449.

DESCRIPTORS: *Refraction, *Polymers, Stresses, Determination, *Test equipment, Optics, Measurement, Molecular structure.

An attachment for an Instron Tensile Testing Machine is described which permits the simultaneous determination of birefringence as a polymer sample is undergoing stress and strain studies. A chamber is provided so that the sample may be held at a controlled temperature during the measurement. (Author)

PB 150 744 $2.60

Wayne State U., Detroit, Mich.
THEORETICAL INVESTIGATIONS ON THE LIGHT SCATTERING OF COLLOIDAL SPHERES. XI. DETERMINATION OF SIZE DISTRIBUTION CURVES FROM SPECTRA OF THE SCATTERING RATIO OR FROM DEPOLARIZATION SPECTRA, by Arthur F. Stevenson, Wilfried Heller, and Morton L. Wallach. Technical rept. no. 42 on Contract [Nonr]-736(00). 15 Aug 60, 28p. 28 refs. AD-243 087.

DESCRIPTORS: *Colloids, Spheres, Light, Scattering, Theory, *Refractive index, Measurement, Molecules, *Molecular structure, Determination.

The theory of a method is developed by means of which size distributions in heterodisperse systems of colloidal and small microscopic spheres can be determined from spectra of the scattering ratio or depolarization. The method is applicable whenever the distribution is unimodal, positively skewed and of the type most commonly found in emulsions. It makes use of the Mie-scattering functions and encompasses α-values up to 25.2 (diameters up to 3.3 microns if the vacuum wavelength is 5460.73 A.) and the relative refractive indices m = 1.05 (0.05) 1.30. The method yields the mean diameter, modal diameter, half width and half-spread of a distribution and, in addition, the diameter of the smallest particles present in consequential numbers. From these data, the entire distribution curve is easily compiled. For those instances where the assumed type of distribution does not apply, an extension of the theory is provided which is based upon a linear combination of two distribution functions of the same type. It allows, in principle, to consider also negatively skewed and bimodal distributions. Use of the linear combination is indicated only when failure to obtain a satisfactory fit between theoretical and experimental spectra shows non validity, in a particular system, of the simple one term distribution function. (Author) (See also PB 149 097)

PB 150 745 $1.60

Wayne State U., Detroit, Mich.
THEORETICAL INVESTIGATIONS ON THE LIGHT SCATTERING OF COLLOIDAL SPHERES. XII. THE DETERMINATION OF SIZE DISTRIBUTION CURVES FROM TURBIDITY SPECTRA, by Morton L. Wallach, Wilfried Heller, and Arthur F. Stevenson. Technical rept. no. 43 on Contract [Nonr]-736(00). 30 Aug 60, 19p. 6 refs. AD-243 088.

DESCRIPTORS: *Colloids, Spheres, *Light, Scattering Theory, Refractive index, Determination, Molecular structure, Molecules, Measurement.

A theoretical method is outlined which gives size distribution curves in heterodisperse systems of non-absorbing colloidal and small microscopic spheres from measurements of turbidity spectra. The assumption made is that the distribution follows a function previously given which closely approximates that commonly found in emulsions. All the numerical data necessary for practical application of the method are provided for the relative refractive indices m = 1.05 (0.05) 1.30 and were obtained from the Mie-theory. The method may be used independently, but is particularly useful as a control in conjunction with an alternate method described in a previous publication. (PB 150 744) (Author)

PB 150 269 $1.60

Wayne State U., Detroit, Mich.
THEORY OF LIGHT SCATTERING BY THIN ROD-LIKE MACROMOLECULES IN A LIQUID SUBJECTED TO SHEAR, by K. Okano and E. Wada. Technical rept. no. 41 on Contract [Nonr]-736(00). 1 Aug 60, 13p. 8 refs. AD-241 959.

DESCRIPTORS: *Light, Scattering, *Molecules, Liquids, Particles, Mathematical analysis

The light scattering by thin rod-like particles in a liquid subjected to shear is calculated on the basis of the Rayleigh-Gans treatment. The calculations are made for both uni-directional laminary flow and for flow of periodically alternating direction. The calculation is carried out by two methods: the interference factor P is expressed in terms of a power series of $\underline{G}/\underline{D}$, where $\underline{G}$ and $\underline{D}$ are the rate of shear and the rotatory diffusion constant respectively of the rod rotating around its minor axis. This treatment is applicable to sufficiently low $\underline{G}/\underline{D}$ values. The result for a very wide range of rate of shear is obtained by using the Peterlin distribution function of particle axis. Numerical calculation shows that both results agree in a region of G/D below about 2 if the axial ratio is large enough. The theoretical results appear to agree with the experimental ones. (Author)

Solid State Physics

PB 155 502 $3.60

Columbia U., New York.
ON THE PARAMETERS IN THE DISTRIBUTION OF FATIGUE LIFE, by E. J. Gumbel. Technical rept. no. T-20 on Contract DA 30-069-ORD-1061. [1960] 34p. 5 refs. CU-14-58-ORD-1061-IE; OOR-1716:14-E; AD-248 238.

DESCRIPTORS: *Fatigue (Mechanics), Probability, *Stresses, Statistical analysis, Distribution, Materials.

PB 155 514 $1.60

Cornell U., Ithaca, N. Y.
PHOTON ABSORPTION BY VALENCE ELECTRON IN ALUMINUM, by D. H. Tomboulian. Technical rept. no. 1 on Grant DA-ORD-37. Jan 61, 19p. 28 refs. OOR rept. 2810:1-P; AD-252 481.

DESCRIPTORS: *Aluminum, *Photons, Valence, *Electrons, Absorption, Energy, Vacuum apparatus, *Spectrographic analysis, Thin films, Metal films, Measurement.

An investigation was made of photon absorption only by valence electrons -- the same electrons which are involved in the characteristic energy loss mechanism. This paper presents measurements of this type dealing with the absorption spectra of aluminum over an incident photon energy range extending from 1^{E} to 50 ev.

PB 152 397 $2.60

Cruft Lab., Harvard U., Cambridge, Mass.
MICROWAVE MODULATION OF LIGHT IN PARAMAGNETIC CRYSTALS, by N. Bloembergen, P. S. Pershan, and L. R. Wilcox. Rept. on Contracts Nonr-1866(16) and Nonr-1866(28). 1 Aug 60, 30p. 49 refs. Technical rept. 325; AD-243 873.

DESCRIPTORS: *Paramagnetic crystals, Microwave frequency, *Modulation, Radiofrequency, *Light, Magneto-optic rotation, Quantum mechanics, Microwaves.

The considerations of Dehmelt and several other workers about the modulation of light by radiofrequency signals in atomic vapors are extended to paramagnetic solids. It is shown that these materials, driven near a microwave resonance at low temperatures may be used both to create and to detect modulation of light at microwave frequencies. Experimental design criteria are discussed at the hand of two numerical examples, modulated circular dichroism in ruby and modulated Faraday rotation in a broad class of ionic rare earth compounds. Some possible applications of microwave modulated light are reviewed. (Author)

PB 155 237 $6.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
X-RAY DIFFRACTION STUDIES OF THERMAL MOTIONS IN CRYSTALS, by R. A. Young. Annual rept. no. 2, 1 June 59-31 May 60, on Contracts Nonr-991(00) and 991(06). [1960] 67p. 23 refs.

DESCRIPTORS: *X-ray diffraction analysis, *Crystals, *Temperature, Scintillation counters, Single crystals, Silver compounds, Sodium compounds, Chlorides, Thermal diffusion.

Research was continued on the questions of (1) what information can be obtained from the temperature dependences of the intensities of Bragg (x-ray) reflections, (2) how the data can and should be gathered and analyzed, (3) how the results compare with crystal physical and crystal chemical information obtained by other techniques, and (4) how these temperature dependences may be used in various studies of crystal physical phenomena. The principal type of data collected was the apparent maximum intensity of Bragg reflections as a function of specimen temperature. A stationary counter, stationary crystal method was used. The principal instrumentation involved a scintillation counter mounted on a Weissenberg camera base. Silver, Molybdenum, and Copper target x-ray tubes were used with and without differential filters and a pulse height analyzer. Sample materials were restricted to single crystals of Silver Chloride (both doped and pure) and Sodium Chloride. (Author) (See also PB 149 856)

PB 150 232 $4.60

Illinois U., Urbana.
PHOTOCHEMICALLY PRODUCED COLOR CENTERS IN KCl AND KBr, by John Cape. Technical rept. no. 5 on Physics of the Solid State, Contract Nonr-1834(19). Aug 60, 47p. 25 refs. AD-241 796.

DESCRIPTORS: *Color centers, *Potassium compounds, Chlorides, Bromides, *Ultraviolet spectroscopy, *Crystals, Ultraviolet radiation, Photochemical reactions, Production, Crystal structure, Single crystals.

KCl and KBr crystals were exposed to unfiltered quartz mercury arc radiation at 15°K. The optical absorption spectrum and the changes in the absorption produced by annealing at higher temperatures were measured and compared with the spectra observed during similar annealing of x-irradiated crystals. In KCl the 335 mμ band formed by the uv-irradiation bleaches thermally at 56°K as does the 335 mμ H band of x-irradiated KCl. The V_1 band appears at 56°K with the disappearance of the H band. In KBr the 381 mu band bleaches in steps at 35°, 46°, 56°, and 80°K as compared with the 381 mμ H band in x-irradiated KBr which bleaches at 30°, 46°, 56°, and 80°K. The V_1 band appears at 46°K and grows at 56°K. Illumination in the V_1 band causes regeneration of the H band as occurs in x-irradiated KBr. In both KCl and KBr the photoproduced H band grows by about 10% at approximately 25°K. It is concluded that the H centers bleach thermally by diffusing to and combining with other color centers. Recombination with F and α centers annihilates the H centers and leads to the formation of V_K centers, while recombination with a third center (possibly a positive ion vacancy) results in the formation of V_1 centers. U, U_1, U_2, O^-, and α centers are produced by the uv irradiation as well as F and H centers. The F center concentration is much smaller in proportion to the H center concentration as compared with x-irradiated KCl and KBr. The photoproduced F centers may be bleached optically at 15°K. (Author)

PB 152 903 $7.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT NO. XXVI. Rept. on Contracts Nonr-1841(10), Nonr-1841(50), AF 19(604)5482 and AF 33(616)5920. Jan 60, 73p. 46 refs. AD-233 192.

DESCRIPTORS: Oxides, *Transition elements, *Alkali metal compounds, *Alkaline earth compounds, Halides, *Ferromagnetic materials, *Ferroelectric materials, Semiconductors, Ceramic materials, Crystal structure, Dielectrics, Thin films, Field emission, Resonance absorption, *Single crystals.

Part I refers to twenty-one investigations on oxide systems, especially those of the transition elements. The 3d electrons offer to molecular science electric and magnetic properties in wide variations, and for molecular engineering most intriguing applications. Part II surveys ten studies on alkaline and alkaline earth halides. These crystals have served for about thirty

years as prototype materials for investigations on ion, electron and hole migration; on color centers, excitons and photoelectric response; on electric breakdown, crystal perfection, dislocations, diffusion, etc. And yet, these "simple" crystals produce ever new surprises, as again the work reported testifies. Part III refers to miscellaneous work on other systems. Two semiconductor studies on II-VI compounds, like a preceding investigation on group I-VII semiconductors (Tech. Rep. 143), keep us abreast but not deeply engaged in this area. The high-pressure research on polar liquids, in contrast, is intended as the opening move of a major effort to learn more about dielectric spectra of polar liquids and electrolytes. Part IV describes some advances in instrumentation and techniques. The project "crystal growth by flame fusion" reviewed under this heading, shall not only serve as a reliable production facility but also for crystallization studies, especially on mixed-crystal systems. (Author)

PB 155 496 $3.60

Laboratory of Experimental Stress Analysis, Illinois Inst. of Tech., Chicago.
FOUNDATIONS FOR THREE-DIMENSIONAL PHOTOPLASTICITY EXPERIMENTS ON THE MEANING OF ISOCLINIC PARAMETERS, by M. M. Frocht and Y. F. Cheng. Technical rept. no. 13 on Contract DA 11-022-ORD-1609. Nov 60, 36p. 9 refs. OOR rept. 1283:13-E; AD-250 321.

DESCRIPTORS: *Plasticity, *Plastic flow, Stresses, Distribution, Analysis, Cellulose nitrates, Optical analysis.

In applying the shear-difference method to the determination of stress distributions in photoplasticity, a basic question arises whether, under plastic flow, the isoclinic parameters represent the directions of the secondary principal stresses. Special equipment, new techniques, and a series of experiments are described to study this problem. These were made with stress systems which varied in magnitude and direction at normal and oblique incidence, and at strains for which a one-to-one stress-optic relation exists as well as at strains for which it breaks down. Typical results are given. These findings together with the method of scattered light and an appropriate stress-optic law may provide a foundation for three-dimensional photoplasticity. (Author)

UCRL-6370

Lawrence Radiation Lab., U. of California, Livermore
NOTES ON GROWING SINGLE CRYSTALS: THE PREPARATION OF SINGLE CRYSTALS OF SOME OF THE TRANSITION METAL FLUORIDES, by E. Catalano and G. S. Stratton. Rept. on Contract W-7405-eng-48. 7 Apr 61, 20p.

PB 155 641 $6.60

Madrid U. (Spain).
STUDIES ON THERMAL TRANSFORMATIONS IN SINGLE CRYSTALS, by J. L. Amorós. Final technical rept. 1 Mar 60-Feb 61, on Studies on Polymorphism in Single Crystals, Contract DA 91-591-EUC-1388. 28 Feb 61, 65p. 22 refs. AD-254 609.

DESCRIPTORS: *Single crystals, Temperature, *Transformations, X-ray diffraction analysis, *Crystal structure, Lattices, *Polymorphism, Phase studies, Goniometers, Design, Ammonium radicals, Nitrates, Carboxylic acids, Urea, Crystals.

The crystal structure of the tetragonal phase, V, of NH_4NO_3 at 120 K was determined by x-ray methods, by cooling single crystals of the room temperature phase. The axes transformations are: $(001)_{IV}$ -- $(001)_V$; $(100)_{IV}$ and $(010)_{IV}$ -- $(110)_V$. The structure as a whole is very similar to that of the tetragonal form of high temperature, differing from phase II in a slight change of orientation (9 degrees) in both the NO_3 and the NH_4 groups, that causes the doubling of the lattice constant c. The following sequence of phases has been established as a general mechanism of polymorphic transformations of rotational type: vibrational phase to the random phase to the rotational phase. A new kind of polymorphic transformation (induced polymorphism) was discovered in the adduct urea-suberic acid at low temperature (below -70 C). Polymorphism has been discovered in adipic acid below -185 C. A Weissenberg camera suitable for low and high temperature work has been developed and built. (Author)

PB 150 660 $2.60

Massachusetts U., Amherst.
THE OPTICAL PROPERTIES OF ORIENTED POLYSTYRENE, by Richard S. Stein. ONR Technical rept. no. 22 on Contract Nonr-2151(00). 15 Aug 60, 24p. 9 refs. AD-244 447.

DESCRIPTORS: *Polymers, *Styrenes, *Crystal structure, *Crystals, *Lattices, *Refraction, Optics, Mathematical analysis, Polarization, Absorption, Molecular structure, Benzenes, Infrared radiation.

Equations are obtained for calculating the birefringence of polystyrene in terms of bond and benzene ring polarizabilities and the five orientation functions necessary to characterize the structure. The absorbency with polarized infrared may also be expressed in terms of these orientation functions providing one is dealing with an absorption band giving its dipole moment change parallel to one of the principal axes. By proper choice of absorption bands, it should be possible to individually measure the various orientation functions. (Author)

PB 150 659 $1.60

Massachusetts U., Amherst.
THE SPECIFICATION OF BIAXIAL ORIENTATION OF POLYMER FILMS, by Richard S. Stein. ONR Technical rept. no. 21 on Contract Nonr-2151(00). 8 Aug 60, 19p. 3 refs. AD-244 446.

DESCRIPTORS: *Polymers, *Ethylenes, Oxides, Films, *Single crystals, *Crystal structure, Lattices, *Crystals, Mathematical analysis.

It is shown that at least four functions are necessary to generally specify the state of orientation of a single phase of a biaxially oriented film. Relationships among these functions under particular constraints are discussed and are described in terms of three dimensional figures in "orientation space." Only certain combinations of values of these functions are permitted. The physical properties of a film may be specified in terms of these functions. (Author)

PB 155 824 $1.60

Materials Research Lab., U. of California, Berkeley.
TENSILE BEHAVIOR OF LITHIUM FLUORIDE, by Donald B. Hoover and Jack Washburn. Technical rept. no. 4 on Ductile Ceramics Research, Contract AF 49(638)601, ARPA Order no. 24-59, Task 2. Mar 61, 19p. 4 refs. IER series no. 150, issue no. 4; AFOSR-436; AD-254 821.

DESCRIPTORS: Crystals, Crystal structure, Lattices, *Single crystals (Metallurgy), *Lithium compounds, Fluorides, Deformation, Plasticity, Fracture (Mechanics), Rupture, Mechanical properties, Tensile properties, Failure (Mechanics), Manufacturing methods, Test methods, Brittle materials, Single crystals.

Two large crystals of lithium fluoride were grown by the Czochralski technique. The crystals were annealed for one week at 490 C and cooled at 45 C/hour. Rectangular specimen bars, approximately 1.25 x .10 x .04 in. were cleaved from these crystals and heated again for 24 hr at 490 C. Further heat treatment tended to remove surface dislocation loops introduced by cleavage and handling of specimens. After polishing, specimens were mounted and tested in tension at about 0.006 in./in./minute. Fifteen specimens that were prepared according to the above procedure were compared with 16 into which mobile surface half loops had been introduced. The following conclusions were made: (1) When the number of slip band sources is small, the yield stress is a function of the number of slip bands that are nucleated. (2) When large numbers of sources are present the yield stress is probably close to the minimum required to move dislocations in the crystal. (3) A slip band on a given (110) (110) system is a more effective barrier to subsequent growth of intersecting bands on the 4 systems that cut through it at 60 degrees than it is to slip on the one other system that cuts through it at 90 degrees. (Author)

PB 155 792 $2.60

Minnesota U. School of Chemistry, Minneapolis.
ABSORPTION OF ELECTROMAGNETIC RADIATION BY A PERFECTLY RIGID CRYSTAL, by C. Alden Mead. Technical rept. no. 1 on Contract AF 49(638)940. 18 Apr 61, 24p. 12 refs. AFOSR-495; AD-254 717.

DESCRIPTORS: *Electromagnetic waves, Theory, *Crystals, Absorption, Dielectric properties, Quantum mechanics, Mathematical analysis, Equations.

The Fano-Hopfield theory of the dielectric constant predicts that a perfectly rigid crystal (one in which no nuclear vibrations are allowed) should exhibit dispersion without absorption. It is pointed out that this result is in conflict with the Kronig-Kramers relations, and hence cannot possibly be correct. If it is assumed that the Fano-Hopfield theory gives the real part of the dielectric constant correctly, the imaginary part can be calculated by means of the Kronig-Kramers relations. This is done for the long-wave, tight binding case, resulting in an absorption curve with finite width. An unobservable delta-function absorption is obtained only if the energy of an exciton is independent of its wave number, a condition which is never satisfied. Since the Fano-Hopfield procedure really depends on the assumption that no absorption takes place, it follows that the theory is inconsistent. It is suggested that the inconsistency probably arises from a too-literal interpretation of the periodic boundary conditions imposed on the radiation field. (Author)

PB 152 745 $3.60

New York U., N. Y.
RESEARCH AND DEVELOPMENT FOR THE STUDY OF THE STORAGE OF ELECTRICAL ENERGY WITH THE HELP OF PERSISTENT INTERNAL POLARIZATION OF PHOSPHORS, by Hartmut Kallmann and Joseph Rennert. Quarterly progress rept. no. 1, 15 June-15 Sep 60, on Contract DA 30-069-ORD-3075. Oct 60, 33p; AD-245 081.

DESCRIPTORS: *Low temperature research, *Phosphors, Polarization; Electrical equipment Energy, Storage.

Low temperature apparatus and measuring equipment for electrical energy storage in phosphor material is described. This apparatus is to be used for measurement of electrical energy storage by persistent internal polarization of phosphor layers at low temperatures. The components are a vacuum tight sample chamber with provisions for thermostating the sample down to liquid nitrogen temperature and circuitry including an electrometer and recorder for measuring and recording the electrical energy stored in the phosphor layers as well as thermocouple leads to measure sample temperature. The details of phosphor sample preparation by sedimentation techniques are described. (Author)

PB 152 304 $5.60

Pacific Semiconductors, Inc., Culver City, Calif.
STUDY OF SURFACES IN SEMICONDUCTOR DEVICES, by T. C. Hall and M. F. Millea. Final technical rept. 1 Apr 57-31 Mar 58, on Contract DA 36-039-sc-73229. 30 Apr 58, 54p. 11 refs. Rept. no. 3000:8-12-F; AD-201 533.

This report released for sale to the public 21 July 61.

DESCRIPTORS: *Semiconductors, Surface properties, Thin films, Silicon, Polymers, Silicones, Crystals, Synthesis.

Methods of synthesis of hydrophobic organo-silicon polymer films of fixed properties chemically bonded to the silicon crystal are described together with possible structures and modes of attachment of such films. Special attention has been given thin native oxide films and thick synthetic polysiloxane film subsequently attached. Applicability of such films in improving device performance and reliability is demonstrated and the effect of such chemically attached films in altering the electronic properties of the silicon surface layer are investigated by means of field effect experiments and channel observations. Field effect experiments indicate that a freshly etched n-type silicon (5-40 ohm-cm) surface is n-type, which on aging becomes p-type. A polysiloxane treated surface of an n-type specimen is p-type initially and remains so. The surface treatment prior to the applications of the polysiloxane film is important in determining the concentration and energy distribution of surface states in silicon.

AD-256 958 repriced $0.50

Stanford Electronics Labs., Stanford U., Calif.
BIBLIOGRAPHY ON DIFFUSION OF IMPURITY ELEMENTS IN COMPOUND SEMICONDUCTORS, by G. L. Pearson. Rept. on Contract DA 04-200-ORD-1087. 7 Apr 61, 11p. 59 refs. Technical rept. no. 1801-1; OOR proj. 2895-E.

DESCRIPTORS: *Semiconductors, Impurities, Diffusion, Bibliography.

A study of the literature pertaining to solid state diffusion in compound semiconductors has been made as a preliminary step to a research project in this area. The resulting bibliography is given in this report in the hope that it may be useful to other workers interested in this subject. While no claim is made that the listings are exhaustive, it is believed that the more important publications are included. This is a relatively new field of research with many interesting problems in need of solution. (Author)

PB 155 137 $1.10

Stockholm U. (Sweden).
THEORETICAL INVESTIGATIONS OF THE ELECTRONIC STRUCTURES AND STATES OF MOLECULES AND CRYSTALS, by Inga Fischer-Hjalmars and Stig Flodmark. Final technical rept. 1 Feb 60-31 Jan 61, on Contract DA 91-591-EUC-1391. [1961] 10p. AD-252 913.

DESCRIPTORS: *Zirconium, *Oxygen, *Crystals, Electrons, Theory, Quantum mechanics, *Crystal structure, Lattices, Solid state physics, Molecules, Programming.

A theoretical investigation was made of the electronic structure and the energy bands for the hexagonal zirconium-oxygen crystal. The following numbered and entitled technical reports, were completed: (1) On the band theory of molecular crystals, by S. Flodmark; (2) Exercise in alpha programming: Table of molecular A and B functions, by S. Flodmark and B. Roos; Calculation and tabulation of expansion coefficients for N shell molecular two-center integrals by means of the electronic computer Besk, by S. Flodmark; and (4) Theoretical investigation of the electronic energy bands for the zirconium-oxygen crystal (Part I--methods of investigation), by S. Flodmark.

Theoretical Physics

PB 155 778 $1.60

Avco-Everett Research Lab., Mass.
COLLISION-FREE PLASMAS, by Harry E. Petschek. Rept. on Contracts AF 49(638)61 and Nonr-2524(00). Nov 60, 14p. 11 refs. AMP 52; AFOSR-360; AD-254 760.

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, Astrophysics, *Shock waves, *Electromagnetic waves, Electrical conductance, Propagation, Particles.

In the corona regions of stars the ratio of the mean free path for interparticle collision to the gyro radius becomes very large. Under these conditions the transport processes in the plasma become dominated by plasma turbulence. This phenomenon can be described in terms of a kinetic theory of a random distribution of waves. The structure of a shock wave under these conditions has been considered. Even at densities as low as 100 particles per cc the thickness of such a shock wave should be very thin, less than 100 km. The effects of such a turbulent wave field on reducing the electrical conductivity has also been considered. It seems possible that appreciable diffusion of the magnetic field relative to the plasma could occur under some astronomical conditions. (Author)

PB 155 795 $1.10

Israel Inst. of Tech., Haifa.
THE STATISTICAL DISTRIBUTION OF THE MAGNETIC MICROFIELD IN A PLASMA, by G. Kalman. Technical Note no. 1 on Contract AF 61(052)177. 10 Oct 60, 9p. 17 refs. ARL-40; AD-254 591.

DESCRIPTORS: *Plasma physics, *Magnetic fields, *Statistical distributions, Electric fields, Particles, Space charges, Ions, Motion.

The distribution of the static magnetic field due to randomly distributed charged particles in phase space is investigated. A Holtsmark-like distribution is derived, centered around 2,0091 B, the latter being the magnetic field caused by a particle moving with the average velocity at an average interparticle distance. (Author)

Thermodynamics

PB 155 830 $3.60

AeroChem Research Labs., Inc., Princeton, N. J.
THE THEORY OF DIFFERENTIAL CATALYTIC PROBES FOR THE DETERMINATION OF ATOM CONCENTRATIONS IN HIGH SPEED, NON-EQUILIBRIUM STREAMS OF PARTIALLY DISSOCIATED GASES, by Daniel E. Rosner. Rept. on Contract AF 49(638)300. Oct 60, 38p. 41 refs. AeroChem TP-19; AFOSR-18; AD-254 660.

DESCRIPTORS: Aerodynamics, *Thermodynamics, Recombination reactions, *Supersonic flow, Temperature, Heat transfer, *Catalysis, *Thermometers, Dissociation, Instrumentation, Physical chemistry, Measurement, Density, Free radicals, Atoms, Gases, *Gas flow.

For low stagnation temperature supersonic streams of dissociated gases, a continuum differential catalytic thermometer (uncooled) can be designed, which, in principle, offers the advantages of: (1) output linearly proportional to free stream atom concentration, regardless of the true kinetic order the interfacial reaction; (2) output insensitive to small changes in the catalytic activities of the probe surfaces, and (3) output insensitive to the details of the gasdynamic environment (Mach number and Reynolds number) and catalyst shape. For high stagnation temperatures, it will probably be necessary to go to internally cooled catalytic probes, since the required thermometer diameters become prohibitively large and, hence, the radiation errors excessive. The aerodynamic uncertainties in-

volved in the probe theory itself are minor compared to the physico-chemical questions raised by the use of probes in non-equilibrium environments. (Author)

PB 154 802 $1.10

Chicago U., Ill.
THERMODYNAMICS OF REFRACTORY AS DETERMINED WITH A MASS SPECTROMETER, by Mark G. Inghram. Final rept. 1 Oct 55-30 Sep 60, on Contract DA 11-022-ORD-1993. [1960] 10p. 20 refs. OOR rept. 1543:22; AD-248 619.

DESCRIPTORS: *Thermodynamics, Determination, *Refractory materials, Mass spectrometers, Tables.

Results of previous studies pertaining to thermodynamics of refractory materials are tabulated. The summary is presented in the following order: (1) systems studied; (2) the container inside of which the study was made; (3) the temperature range; (4) the gaseous species observed with the predominant gaseous species first, followed by other species in descending order of importance; (5) the reactions for which thermodynamic calculations can be made; and (6) the delta H for the reaction listed. The results may be plotted as a function of atomic number, and, by extrapolation, good predictions can be made for systems not yet studied. Analogies are also given for metal oxide, metal sulfide, and metal carbide molecules. Results indicate a distinct gaseous chemistry.

PB 152 221 $1.10

Illinois U., Urbana.
GENERAL INVESTIGATIONS OF THIN SHELLS INCLUDING THE EFFECT OF NONHOMOGENEOUS TEMPERATURE DISTRIBUTION, by A. P. Boresi. Final rept. on Contract [Nonr] 1834(14). Aug 60, 6p. 8 refs. T.&A.M. rept. no. 177; AD-245 106.

DESCRIPTORS: *Elastic shells, *Structural shells, *Cylindrical bodies, Temperature, *Stresses, *Thermal stresses, Elasticity, Theory, Deflection, Deformation.

A summary was given of analytical investigations of thin shells including the effect of nonhomogeneous temperature distribution. The analysis deals only with the elastic equilibrium behavior of geometrically perfect shells; initial dents and out-of-roundness were not considered. The main results derived in the eight technical reports issued are discussed. (Author)

PB 152 119 $5.60

Illinois U., Urbana
STRAIN ENERGY EXPRESSION FOR LARGE DEFORMATIONS OF ISOTROPIC ELASTIC SHELLS SUBJECTED TO ARBITRARY TEMPERATURE DISTRIBUTION, by A. P. Boresi and I. C. Wang. Technical rept. no. 8 on Contract Nonr-1834(14). Aug 60, 53p. 4 refs. T. & A. M. rept. no. 176; AD-245 105.

DESCRIPTORS: *Elastic shells, *Thermal stresses, Deflections, Buckling, Stresses, Elasticity, Deformation, *Cylindrical bodies, *Spheres, Mathematical analysis.

Expressions for the strain components of an arbitrary point in an elastic isotropic thin shell of any shape are given in terms of the strain components of the middle surface and fuctions of (x, y, z). These results are specialized for the circular cylindrical shell, Similar results for the sphere and for the right-circular cone are given. A strain energy expression for a circular cylindrical shell subjected to a temperature distribution that is an arbitrary function of middle surface coordinates (x, y) is also given. Similar expressions for a spherical shell and for a right-circular conical shell may be obtained. In general, the practical use of these expressions is formidable even with the use of digital computers. For equilibrium studies of very thin shells, it is questionable that terms beyond h^3 are significant. However, in questions of thermal buckling and post-buckling behavior, higher degree terms in h may be significant. (Author)

PB 155 596 $6.60

Instituto de Quimica Fisica (Spain).
ENERGY TRANSFER IN ORGANIC VAPOURS, by A. P. Masiá and M. D. Sonet. Final technical rept. 1 Mar 60-28 Feb 61, on Contract DA 91-591-EUC-1387. [1961] 63p. 43 refs. AD-254 499.

DESCRIPTORS: *Heat transfer, Test equipment, *Organic compounds, Vapors, Measurement, Methanes, Halogen compounds, Temperature, Pressure, Chlorides, Fluorides, Bromides, Gases, Test methods, Wire, Purification, Platinum, *Halocarbons, Conductivity, Determination.

The hot wire method has been used to measure the thermal conductivities of gaseous CCl_4, $CBrF_3$, CBr_2F_2, CBr_2Cl_2, CCl_3F, CBr_3F, CH_2BrCl and $CHBrCl_2$ at different pressures and temperatures. The ranges of variation of these quantities are 25 to 900 tor and 5 to 135 C. The main part of the apparatus is a conductivity cell consisting of a platinum wire of 0.037_6 mm diameter, situated along the axis of a brass cylinder of 3 mm. inner diameter. This cylinder contains the gas under study. Electrical currents of two different intensities are successively passed through the platinum wire, which forms one branch of a Wheatstone bridge. The ohmic resistance R of the wire is measured in both cases, as well as the voltage drop E between the ends. The errors of the relative values determined in the present work are estimated to be of the order 0.1%. A qualitative discussion of these results has been made on the basis of elementary kinetic theory of gases. A more quantitative picture was possible in the case of CCl_4, which is the only compound here studied which has zero dipolar moment. (Author)

KAPL-2146 $0.50

Knolls Atomic Power Lab., Schenectady, N. Y.
APPLICATION OF THE EWING EQUATION FOR CALCULATING THERMAL CONDUCTIVITY FROM ELECTRICAL CONDUCTIVITY, by A. E. Powers. Rept. on Contract W-31-109-eng-52. 7 Apr 61, 14p.

PB 150 658 $1.60

Massachusetts U., Amherst.
THE THERMODYNAMICS OF BIAXIAL ELONGATION, by Richard S. Stein. ONR Technical rept. no. 20 on Contract Nonr-2151(00). 1 Aug 60, 12p. 7 refs. AD-244 445.

DESCRIPTORS: *Thermodynamics, *Solids, Deformation, Stresses, Mathematical analysis, Pressure, Volume.

A mathematical analysis for the change in entropy, S, and internal energy, E, for a solid with simple elongation is extended to a solid with 2-dimensional deformation in order to elucidate the molecular mechanisms of such processes. The thermodynamics of the system are analyzed according to (1) the stresses and strains relative to the original dimensions, (2) constant pressure, and (3) constant volume. These investigations are of interest in comparing the thermodynamic changes for a simple elongation with that of a 2-dimensional elongation, and in determining how changes in one direction are affected by the state of elongation in the second direction.

PB 150 030 $1.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
THEORETICAL CONSIDERATION PERTAINING TO THERMAL DOSE METERS, by Herman P. Schwan. Technical rept. no. 31 on Contract Nonr-551(05). 16 Aug 60, 13p. AD-242 618.

DESCRIPTORS: *Electromagnetic fields, Measurement, Dipole antennas, Meters, *Electromagnetic theory, Dosimeters, *Thermodynamics, Thermal radiation.

PB 150 226 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
NUMERICAL STRESS ANALYSIS OF CIRCULAR CYLINDRICAL SHELLS. PART II. A PRELIMINARY STUDY OF A NUMERICAL SCHEME FOR EDGE EFFECTS, by J. R. M. Radok. Rept. on Contract Nonr-839(26). Aug 60, 23p. 4 refs. PIBAL rept. no. 577; AD-241 777.

DESCRIPTORS: *Stresses, Structural shells, *Cylindrical bodies, Mathematical analysis, *Elastic shells.

In shells, stress concentrations occur near boundaries, around localized changes of shape of a shell, in the neighborhood of variations of external loads, etc. The associated phenomena are referred to as edge effects or as stress conditions of the mixed type and their study comprises one major group of the problems of shell theory. Analytical solutions of these problems are usually based on more complete equations than those which govern the stresses in shell regions lying at some distance from the stress concentrations. A simplification of the analysis is achieved by reduction of the number of boundary conditions, i.e., by assuming that there is no interference from parts of the boundary which lie in the direction of the normal to the boundary under consideration. Eventually, the edge effects are patched together by means of a membrane solution determining the stresses in the internal region of the shell. For example, for a finite, but long cylindrical shell subject to axially symmetric loading, the edge effects are determined by solution of one point boundary problems for ordinary differential equations, while the membrane state is described by the solution of a two point boundary problem for the same type of equation. (Author)

SCR-288 $2.00

Sandia Corp., Albuquerque, N. Mex.
MACH TABLES FOR REAL GAS EQUILIBRIUM OF AIR IN HYPERVELOCITY TEST FACILITIES WITH TOTAL TEMPERATURES TO 10,000°K, by K. L. Goin. Mar 61, 82p.

DP-562 $0.50

Savannah River Lab., Aiken, S. C.
HEAT TRANSFER BURNOUT OF A SURFACE CONTRACTED BY A SPACER RIB, by S. Mirshak and R. H. Towell. Rept. on Contract AT(07-2)-1. Apr 61, 22p.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 150 463 $1.10

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
TWO THEOREMS ON ERROR CORRECTION, by Roger David Joseph. Technical memo. no. 17 on Proj. Para, Contract [Nonr-2381(00)]. 1 Aug 60, 7p. 2 refs. AD-242 507.

DESCRIPTORS: *Memory devices, Signal generators, *Learning, Theory, Errors, Corrections, Matrix algebra, Mathematical analysis, Electrical networks.

For an elementary perceptron with a gamma reinforcement rule, if there exists any combination of reinforcements to the stimuli which will enable the perceptron to correctly classify its environment, the error correction procedure of Tech Memo no. 13 (PB 161 996) is shown to find such a combination in finite time. A necessary and sufficient condition for the existence of such a solution is derived, and the analogous condition for alpha systems is obtained. (Author)

PB 155 119 $8.10

Operations Research Office, Johns Hopkins U., Bethesda, Md.
PROCEEDINGS OF THE ARMY-ORO CONFERENCE ON BASIC AND APPLIED RESEARCH AND COMPONENT DEVELOPMENT. VOLUME IV; PAPERS 10, 11, 13 AND 15, ed. by Jerome B. Green. 85p. 13 refs. ORO Staff Paper no. 68.

This report released for sale to the public 20 July 61.

DESCRIPTORS: *Operations research, *Military research, Microwave amplifiers, *Thermonuclear reactions Electronic equipment, Conferences

Contents:
Principles of controlled thermonuclear reactions
Low-noise microwave amplification and generation
The Army research program
Future trends in research in electronics components and devices.

PB 156 832 $9.60

Speech Research Lab., U. of Michigan, Ann Arbor.
OBJECTIVES AND TECHNIQUES OF SPEECH SYNTHESIS (PART I) [AND] SEGMENT INVENTORIES FOR SPEECH SYNTHESIS (PART II) by Gordon E. Peterson and Eva Sivertsen. Rept. no. 5 on Studies on Speech Synthesis, Contract Nonr-1224(22). Aug 60, 120p. 43 refs.

DESCRIPTORS: *Speech, Synthesis, Machine translation, Language, Acoustics, Philology, Vocabulary, *Speech representation, *Information theory, Communications theory, Intelligibility.

The synthesis of speech is discussed as one of the simpler problems of language automation. Two basic methods of speech synthesis are considered: (1) the generation of speech from stored segments; and (2) the generation of speech through continuous control of the various speech parameters individually. Speech synthesis may be based on a segmentation of the speech continuum either into simultaneous components or into successive time segments. The time segments may be of varying size and type: phonemes, phoneme dyads, syllable nuclei and margins, half-syllables, syllables, syllable dyads, and words. In order to obtain an estimate of the size of the segment inventory for each type of segment, a phonological study was made of the particular phoneme sequences which occur in English, particularly in relation to the immediate constituents of the syllable (nucleus and margin) and to the syllable. An estimate was also made of the number of prosodic conditions required for each type of phoneme sequence. It was found that in general there is a direct relationship between the length of the segment and the size of the inventory. However, when the borders of the proposed segments do not coincide with the borders of linguistic units, the inventory has to be relatively large. The value of using the various types of segments for speech synthesis is discussed, both for basic research on speech and for practical application to a communication system with high intelligibility. (Author)

Communication Theory

PB 156 875 $3.60

Hydel, Inc., Waltham, Mass.
THE DEVELOPMENT OF A PHOTOMEMORY, by Carl E. Nielsen, Jr. Annual summary rept. no. 2, 15 Aug 59-15 Aug 60, on Contract Nonr-2668(00). [1960] 31p. AD-248 905.

DESCRIPTORS: *Photoelectric cells, Design, *Reading machines, *Machine translation, *Data storage systems, *Photographic film, *Data processing systems, *Memory devices, *Digital computers, *Photographic equipment, Documentation.

The demonstration reading system of the photomemory performed reliably on 0.006 in wide bits over a limited plate area. Slight improvements in the illumination system will enable the demonstration reader to perform reliably on a 2 x 2 in data plate containing 0.004 in wide bits. The results thus far indicate that the ultimate desire to read a 4 x 4 in plate containing 0.001 x 0.004 bits is feasible. Future efforts will be directed towards this end. Efforts on development of the photomemory writing system were confined to showing the basic feasibility of the scheme and selecting the proper materials for further experiments. Data was written on a film in the form of bits approximately 0.006 x 0.020 in. This data was reproduced from a track of the data plate at a rate of 20,000 bits/sec. with one mirror scan. More contrast in the negative and smaller bits on the plate are immediate goals and may be achieved by more efficient utilization of the writing light source. A prototype photomemory is anticipated as the result of further developments. A reading system utilizing a larger plate and smaller bits as well as a preliminary writing system will be incorporated in the prototype. (Author)

PB 156 877 $11.00

Wayne State U., Detroit, Mich.
RESEARCH IN MACHINE TRANSLATION, RUSSIAN ⟶ ENGLISH, by H. H. Josselson and Arvid W. Jacobson. Annual rept. no. 2 on Contract Nonr-2562(00). 31 Aug 60, 150p. AD-248 503.

DESCRIPTORS: Programming, Coding, Language, *Machine translation, Dictionaries.

The principal efforts have been directed toward important aspects of machine translation in the following areas: (1) grammar coding; (2) syntactic analysis; (3) programming; and (4) construction of a glossary (including an investigation of multiple meaning problems).

Photographic Materials

PB 150 893 $3.60

Battelle Memorial Inst., Columbus, Ohio.
CONTINUOUS-TONE ELECTROSTATIC ELECTROPHOTOGRAPHY, by W. E. Bixby, R. I. Mitchell, and L. E. Walkup. Quarterly progress rept. no. 1, 1 Sep-30 Nov 55, on Subcontract to Contract DA 36-039-sc-70130; Continuation of Contracts DA 36-039-sc-123, -42612 and -64581. 30 Nov 55, 33p. 4 refs. AD-90 945.

This report released for sale to the public 19 July 61.

DESCRIPTORS: *Electrophotography, Metal plates, Porosity, Photographic plates, Photographic equipment, Particles, Electrodes, Powders.

The basic purpose of the work conducted on this project during the past three months has been to improve the quality of continuous-tone electrophotographs. The work has been concentrated on the image-development step of the process. One phase of the work has been aimed at obtaining a better idea of the electrical charges on the particles forming the powder clouds. A powder-charge-measuring instrument, designed on a previous project sponsored by the Signal Corps, has been improved to

the point where it now can be used routinely as a tool in determining the electrical charge characteristics of powder clouds produced under various conditions. Completion of this device promises to open a whole new field of important and helpful information that has been inaccessible heretofore; the instrument now is in daily use. Another phase of the work has been directed at the general problem of reducing the size and number of agglomerates of powder particles that enter the development zone. Work recently has been on a preliminary exploration of the use of a porous-plate development electrode.

PB 153 786 $6.60

Battelle Memorial Inst., Columbus, Ohio.
PREPARATION OF LITHOGRAPHIC PLATES BY XEROGRAPHY FOR THE REPRODUCTION OF MILITARY MAPS AND CHARTS, by J. J. Rheinfrank, P. F. Kurz and others. Final progress rept. 16 July 55-31 Aug 56, on Subcontract to Contract DA 44-009-eng-2640. 31 Aug 56, 64p. 15 refs.

DESCRIPTORS: *Photographic plates, Preparation, *Lithography, *Electrophotography, *Maps, Reproduction.

This report describes significant advancements in printing photomaps directly from zinc oxide-silicone zerographic plates, and contains a preliminary evaluation of presently known xerographic printing systems for reproducing military maps.

SOCIAL SCIENCES

PB 150 114 $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
EXISTENCE AND EFFICIENCY IN A COMPETITIVE MODEL OF CAPITAL ACCUMULATION, by Hirofumi Uzawa. Technical rept. no. 87 on Contract Nonr-255(50). 5 Aug 60, 32p. 20 refs. AD-241 440.

DESCRIPTORS: *Scheduling, Production, Statistical analysis, *Economics.

The Dorfman-Samuelson-Solow theory is formulated in terms of activity analysis, and those conditions under which the existence and stability of such a competitive process of capital accumulation hold are investigated. The Dorfman-Samuelson-Solow theory [Linear Programming and Economic Analysis, McGraw-Hill, N.Y., 1958] indicates that the states of steady growth of the Harrod-von Neumann type [Fenchel, W. Convex Cones, Sets, and Functions, Math. Dept., Princeton U., 1953] are the long-run equilibria of the competitive processes in the neoclassical as well as in the von Neumann-Leontief linear production model. A competitive model of capital accumulation is formally constructed in terms of activity analysis, and the identity of such a competitive condition with the Dorfman-Samuelson-Solow intertemporal efficiency of capital accumulation is discussed. Production is assumed to be subject to constant returns, to scale. The existence of the von Neumann balanced growth equilibrium is investigated. In the case in which technical inventions are neutral in Hicks' sense [The Theory of Wages McMillan, London, 1932], a balanced growth competitive path is generated by a von Neumann equilibrium. The existence condition for competitive processes is investigated where the condition is reduced to the one similar to the factor price equalization condition as obtained by A. P. Lerner [Economica (N.S.) 19:1-15, 1952] and P. A. Samuelson [Rev. Economics Studies 21:1-20, 1953-54] in the context of international trade theory. It is shown that under the indecomposability condition, every competitive path, if it exists for all finite time horizons, tends to a von Neumann balanced growth equilibrium.

PB 156 873 $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE STABILITY OF COMPETITIVE ECONOMY: A SURVEY ARTICLE, by Takashi Negishi. Technical rept. no. 88 on Contract Nonr-225(50). 26 Aug 60, 28p. 36 refs. AD-245 434.

DESCRIPTORS: Costs, *Economic conditions, *Scheduling, Statistical analysis, Statistical processes.

Contributions to the theory of the stability of competitive economy are surveyed. The stability problem is concerned with the question of what happens to prices if initially they are different from equilibrium. (Author)

PB 157 073 $13.00

Operations Research Office, Johns Hopkins U., Chevy Chase, Md.
A SYSTEM FOR HANDLING DATA ON UNCONVENTIONAL WARFARE, INCLUDING A BIBLIOGRAPHY OF OPEN SOURCES, by D. M. Condit. May 56, 188p. 985 refs. Technical memo. ORO-T-339; AD-105 860.

This report released for sale to the public 24 July 61.

DESCRIPTORS: *Warfare, Data, Handling, Data storage systems, Bibliography.

The system described in this memorandum, using the addressograph machine, provides a permanent means of storing data on unconventional warfare and a way to make immediately accessible a printed list of the body of knowledge on that subject. The system for handling information on unconventional warfare can be modified and adapted to other subjects, and in cases where the sources of data are numerous and study needs fluctuate, adoption of a similar system, which could be based on use of the same addressograph machine, is warranted. (Author)

PB 171 909 $0.75

Zator Co., Cambridge, Mass.
THE "TAPE TYPEWRITER PLAN": A METHOD FOR COOPERATION IN DOCUMENTATION, by Calvin N. Mooers. Rept. on Contract AF 49(638)376. July 60, 25p. 3 refs. ZTB-137; AFOSR-TN-60-532; AD-239 984.

DESCRIPTORS: *Documentation, *Typewriters, *Data processing systems, *Magnetic recording systems, Libraries, Library science, Bibliography, Automation.

The tape-typewriter plan is a plan for cooperation in documentation between libraries, while facilitating the internal clerical and cataloging operations at individual

libraries. The plan is based upon the use of a tape-controlled typewriter and the associated use of electronic computers and their related devices. Any individual library requires only a tape typewriter in order to enter the plan and to become a full cooperator. By exchange of tapes between libraries, duplication of bibliographic work at cooperating libraries can be markedly reduced. Conformity to any single classification system or to any specific catalog card format is not required, since the information processing machines can make new tapes for other formats, and can perform translations from one classification system to another. The information processing machines can also be used for rapid compilation of special indices, lists, etc., for the documentary resources of all the cooperating libraries. Important aspects are that it does not require setting up a unique large-scale universal documentation center for processing, search, or storage; it does not require conformity in the choice of tape typewriter equipment; it does not require library ownership of computing equipment; nor does it depend upon any specific choice of computing equipment. (Author)

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U. S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data, with national and often State and regional breakdowns, on manufacturing, wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

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